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FROM THIS ROOM**MAGAZINE**

VOLUME 5 NUMBER 22

DECEMBER 23, 1986

**FIRST LOOK: HANDS-ON  
REVIEW OF NEWVIEWS,  
AN ACCOUNTING BREAKTHROUGH****More Power  
For Portables**

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Animate Your  
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# Borland's award-winning software is the best Holiday present you can give yourself or anyone else

**A**ny one of these Holiday presents could save your marriage, career, reputation and quite a few bucks.

When you give or get any one of these Holiday presents, every day's a Holiday, because you're giving or getting long-lasting software that's a lot more welcome to the Woman in your Life than vacuum cleaners, egg-beaters and ugly earrings. And the Man in your Life would rather have Turbo Prolog, "Reflex," Reflex Workshop, "Turbo Pascal," Turbo Lightning or SideKick™ than socks, tee and wrong-size shirts.

**Turbo Prolog takes you by the hand into the brave new world of Artificial Intelligence**

Artificial Intelligence is no substitute for the human brain (well, most human brains; you make your own list), but it is a fascinating new field, and we're leading it with our 5th-Generation Turbo Prolog. In fact, people are telling us that Turbo Prolog is "The most exciting product they've seen this year." So see it for yourself. Give it. Get it. You deserve it.

**Turbo Pascal wins PC World's 1986 World Class PC Award for 'Programming Language'**

**Give someone our Turbo Pascal "Jumbo Pack," but keep some of the precious pieces for yourself**

There's so much in there—Turbo Pascal, Turbo Tutor, Turbo Database, Turbo Graphix, Turbo GameWorks, Turbo Editor—you can probably give someone else one or two of them. (Just keep the ones you don't have already and make the rest thoughtful, really inexpensive presents for someone's Turbo Pascal library.)



**Give them one, maybe two kinds of Holiday Reflex action!**

Adam B. Green, InfoWorld's highly respected columnist, says "Everyone agrees Reflex is the best-looking database they've ever seen." Peter Norton of PC WEEK says, "The next generation of software has officially arrived." And now, with our brand-new Reflex Workshop, which includes 22 instant ways to run your business well, you can give someone both programs and just about guarantee them a Happy well-run New Year!

**Turbo Lightning wins the 1986 World Class PC Award for "Most Promising Newcomer"**

**Solve your gift-giving and spelling problems now with Turbo Lightning**

While you use SideKick, Reflex, Lotus 1-2-3® and most popular programs, Turbo Lightning proofreads as you write! If you misspell a word, Turbo Lightning will beep at you instantly, and suggest a correction for the word you just misspelled. Press one key, and the misspelled word is immediately replaced by the correct word. And if you're ever stuck for a word, Turbo Lightning's thesaurus is there with instant alternatives. Perfect gift for everyone who reads and writes!

**Attention SideKick users!  
Your SideKick now has a sidekick!**

**If you're going anywhere for the Holidays, you'll need a Traveling SideKick!**

It's the electronic organizer for this electronic age—a professional binder, a software program and a report generator—a modern business tool that prints your ever-changing appointments in daily/weekly/monthly/yearly form. Your appointments, phone list, address list, meeting schedule, travel itinerary—even your mailing list—can be kept up-to-the-minute correct and with you! (SideKick Owners: All your files translate instantly to Traveling SideKick.) Traveling SideKick is electronic, so it's good for this year, next year and all the next years after that—it's not a dusty old diary that dies Dec. 31!

CIRCLE 138 ON READER SERVICE CARD



## Borland's Instant Winner Game

Scratch this card now and you could *instantly* win 2 free round-trip airline tickets to Australia for the America's Cup Race!



\$10,000

First Prize (\$10,000 value!) includes accommodations for two in Perth, Australia during the final America's Cup races, which start January 31, 1987. See America win it back after our *only* loss in 134 years! There's more than one instant winner in Borland's Instant Winner Game, because you could win one of two new \$6,895 4-WD Suzuki Samurai convertibles, or a \$4,995 printer, or a \$4,499 \$2,399 Toshiba T1100™ AST SixPakPremium™, or a \$69.95 Traveling SideKick,® or any one of hundreds of other Borland products—and at



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\$69.95

the very least a Borland Rebate Coupon, good for \$10 off any single product or \$15 off any bundled product offer!

See Official Rules on the back of this card for details.

Don't delay! There will be a second-chance drawing for the trip if not claimed by 12/31/86. There's also a second-chance drawing for the two Suzecks if not claimed by 2/28/87. All rebate coupons are good for products purchased 9/6/86-3/31/87. Product prices above are suggested list price.

Rub the silver box to reveal whether you win a prize or get a rebate coupon. Then fill in the second-chance entry blank to the right.

**SCRATCH  
'N WIN!**



### Second-Chance Sweepstakes Entry!

We're running two Second-Chance Sweepstakes drawings to award the trip and cars. They will be won by someone—it could be you! Fill in the entry coupon and mail it now. Winners will be notified immediately, because the final America's Cup races start in Australia on January 31, 1987, and you'll have to pack in a hurry.

(You will need a valid passport and the ability to comprehend Australian versions of the English language.)

Name \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_

State \_\_\_\_\_ Zip \_\_\_\_\_

**OFFICIAL RULES - BORLAUG INSTANT WINNER GAME**

1. NO PURCHASE NECESSARY: To participate, you may obtain a game card mailed to the October, November, December, or January issue of the following magazines: PC World, Byte, PC Tech Journal, PC Magazine. You may also obtain a game card by mailing a self-addressed, stamped envelope to: Borland International Game Card, P.O. Box 870, Wilton, CT 06897. (Washington State residents send self-addressed envelope.) Limit one game card per stamped request. All requests must be received by January 15, 1987.

2. TO WIN: Fill in the instant win area on the game card to reveal what prize or rebate offer you have earned.

3. PRIZES/REBATES: Research the reb-off area one of the following places may be revealed: Top for Two in America's Cup Races or \$10,000; 1986 Scrolz 4W Sampler Convertible or \$8,000, AST Turbo Laser, Toshiba 1100 Portable Computer, Toshiba 1300 Portable Computer, AST Superspinwriter, AST Advertiseprom; AST 2D Pak, AST Remape, AST Remape AST, Free Borland Product, or you may obtain the following rebate offer: \$10 rebate offer on any individual product or \$15 rebate offer on any single advertised Borland bundle. (See Rule #11 for prize details.)

4. PURCHASE DETAILS: Purchase of the game card, \$2.00, will entitle you to one drawing on the game card and send us certified mail or registered mail with your name and address to: Borland International Price Card, 198 Canterbury Road, Wilton, CT 06897. All prize claims must be received or postmarked by February 15, 1987. (See Rule #12 for Top for Two in America's Cup exception.)

5. REBATE CLAIMS: Rebates are good for products purchased from September 5, 1986 through March 31, 1987. The \$10 rebate is good for any advertised Borland product and the \$15 rebate is good for any advertised Borland software bundle. To receive your rebate you must return your completed license agreement from the moment, this game card and dated proof of purchase to: Borland International, Game Card Rebate, 4560 South Valley Drive, Santa Clara, CA 95056. Upon receipt of the rebate application, Borland will process the rebate within 45 days.

6. VERIFICATION: All game materials are subject to verification. Game materials are valid and will be rejected if not obtained through authorized legitimate channels, and may be rejected if any part is reproduced, counterfeited, tampered or altered in any way, or if materials contain printing, typographical, or mechanical errors. Decisions of the Redemption Center are final. Game pieces from any game other than the Borland Instant Winner Game may not be used at this game.

7. CONDITIONS OF PARTICIPATION: Material submitted becomes the property of Borland International. The submission of game pieces in the sole responsibility of the individual making verification, who is solely responsible for test, test, test, or modification of all game pieces. Game pieces will be returned to the original sender. Winners may be required to assume an expense of publicity and news and business publicity releases. By participating in the game you accept and agree to be bound by these rules and the decision of the Official Redemption Center which will be final.

8. ELIGIBILITY: Participants can earn rebates to residents of the United States 18 years of age and over, except employees and agents of Borland International, service agencies, and individuals engaged in the development, production, or distribution of computer software, hardware, or services, or their immediate family members. Void in Vermont, and where prohibited by law.

9. GAME SCHEDULE AND AWARDS OF PRIZES: The Borland Instant Winner Game and competition are open to residents of the United States, 18 years of age and over, and no earlier than December 31, 1986 and no later than March 31, 1987. It will officially end, and, however, when all game pieces are distributed. Verified game prizes will be awarded within forty (40) days from the date of their receipt for verification at the Official Redemption Center. A major prize winner's list can be obtained by sending a stamped, self-addressed envelope to: Borland Instant Winner Game, P.O. Box 7000, Wilton, CT 06897.

10. PRIZE CHART: The odds of winning prizes are based upon obtaining the one rare game piece among the applicable number of game pieces.

Qty.	Total Value	Odds of Winning
1	\$ 10,000.00	1 in 8,456,000
2	\$ 13,750.00	1 in 3,228,000
3	\$ 15,000.00	1 in 2,000,000
4	\$ 16,250.00	1 in 2,228,000
5	\$ 15,025.00	1 in 258,320
1,000	\$ 40,000.00	1 in 8,456,000
1,631	\$ 100,000.00	1 in 8,456,000

All winning game cards will contain a \$10 rebate good on any individual Borland product or a \$15 rebate good toward any advertised Borland software bundle.

11. PRIZE DETAILS: Top for Two in America's Cup Races (or \$10,000) will include coast-to-coast round trip airfares on regularly scheduled commercial airlines from San Francisco, California to Perth, Australia and up to two weeks hotel accommodations in Perth, Australia plus \$4,500 spending cash. Winners will be responsible for obtaining visa, passport, and all other travel documents. Top does not include meals, taxes, excess baggage charges and other travel charges. Minor travel is acceptable. Void in Vermont, and where prohibited by law.

Scrolz 4W Sampler Convertible, JA Standard Equipment Package (or \$8,000), will be responsible for all registrations, insurance, and licensing fees. AST Turbo Laser, Toshiba Portable Computer Model #11100, AST Portable Computer Model #13100, AST Memory Boards and Free Borland Products are non-transferable. Winners are responsible for all taxes, state and federal taxes, and other expenses. Taxes are the responsibility of the winner.

12. SECOND CHANCE SWEEPSTAKES: The Borland Instant Winner Game Sweepstakes drawings scheduled to be conducted on December 31, 1986 and February 28, 1987. Random drawing from a series received by December 31, 1986 will award top for Two in America's Cup Races (or \$10,000). Random drawing from a series received by February 28, 1987 will award two (2) Scrolz 4W Samplers (or \$8,000). All remaining prizes that are unclaimed after February 15, 1987 will remain unclaimed. Send entry to: Second Chance Entry P.O. Box 970 Wilton, CT 06897.

If you have any questions concerning the Borland Instant Winner Game, call 1-800-441-6421.

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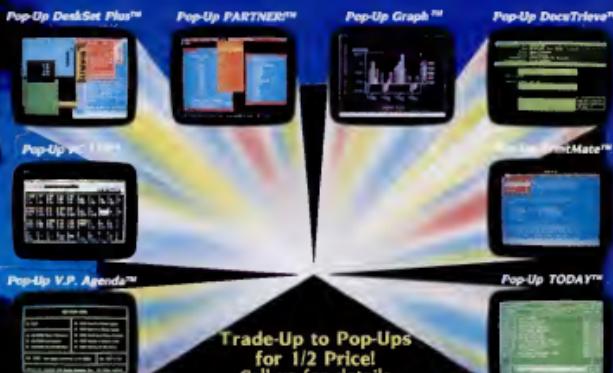
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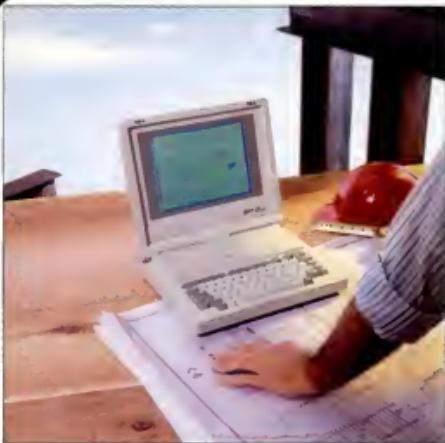
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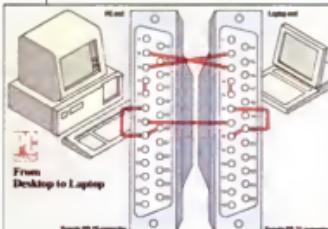


## COVER STORY



**Editor's Choice:**  
Toshiba's T1100 Plus

**DOS Travels Better Now: What's New in Portables**  
*Jon Pepper/*What a difference just 5 months can make! The last time we surveyed the portables scene, we felt that none of the machines we tested was worthy of being selected as an Editor's Choice. But since then, keyboards have been redesigned, screens have become brighter, and performance has improved—**witness the Toshiba T1100 Plus** and T3100, the GridCase 3 Plus, the Data General One/Model 2, the Zenith Z-181 Portable PC, and the HP Portable Plus. Maybe now the portable PC revolution has really begun ..... 118



**T**HE multiport serial card you need to make the most of your portable computer is called the "card of all cards," and it's the latest hot item in PC LANs. Most of these cards are designed to add two or three serial ports to a PC through the parallel port. They also add one or more serial ports, some IEEE 488, and even a mouse port.

Some 386 systems based on the 20 pin parallel port can't support the IEEE 488 port, so if you're not sure whether your machine can handle it, ask the manufacturer. The best place to look is the company's catalog or the back of its manual. If you're not sure about the IEEE 488 port, then there's no better place to turn than the documentation that came with your computer.

The 20 pin parallel port is used for connecting a printer to a computer, so most desktop PCs have a parallel port. If yours doesn't, you'll have to add a parallel port card to your system. It's a relatively inexpensive card, and it's available from most computer stores.

If you're not sure what kind of parallel port card you need, then you'll have to consult the manual for your computer. Most desktop PCs have a standard parallel port, which is the 25-pin type. If you have a 20-pin parallel port, then you'll need a converter card to change the 20 pins to 25 pins.

## FEATURES

## HARDWARE

**Multiport Serial Cards: Breaking the Two-Port Limit**  
*Winn L. Rosch/*How would you like to add from four to eight extra serial ports to your PC? The advantages of having a plethora of ports are numerous, and you can get them easily and relatively inexpensively. Reviews of these limit-breaking cards include the Amet Multiport, the Star Gate OC8000, Computone's AT-Vantage-M, AMI's LAMB, and Control Systems' Hostess 8 ..... 147

## GRAPHICS

## Making an Impact with Graphics

**Marvin Bryan/**In today's computerized office, graphics software is as common a sight as the PC itself. But when it comes to judging these programs, ease of use is as important as the quality of the final output. Take a look at *Perspective*, *Decision Graphics*, *Harvard Presentation Graphics*, *Graphwriter*, *Freelance*, and *The Gallery Collection* and judge for yourself ..... 167



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*Alfred Poor/*Here are in-depth reviews of five popular presentation packages that will liven up your marketing demos, tutorials, and slide shows: *Dan Bricklin's Demo Program*, *Show Partner*, *PC Storyboard*, *Instant Replay*, and *AutoMentor* ..... 199

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**Making Connections: AT&T's StarLAN**  
*Frank J. Dresler, Jr./*New standards are allowing LAN builders to fashion networks



from parts made by different vendors. AT&T's product is an example of how this works. This review compares performance of StarLAN cards running under StarLAN software to their performance under Novell's Advanced NetWare. We also match up the StarLAN cards with two different servers ..... 223

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**Big, Beautiful, and Black and White**  
*Winn L. Rosch/*A close-up look at how two ultra-high-resolution monochrome monitors—Monitron's Viking I and Wyse's WY-700—deal with *Microsoft Windows* ..... 243

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## Cover Photograph:

Roberto Brosan

# WHAT'S INSIDE



Cover story author Jon Pepper

Of all the computers, peripherals, and software that pass through *PC Magazine* each year, few products ignite passions as greatly as laptop portables. One editor's favorite may be another's laughingstock. And the better the machine, the greater the polarization. Two of the best machines in "DOS

Travels Better Now: What's New in Portables," the Toshiba TI100 Plus and the Zenith Z-181 Portable PC, could be summarized as Less Filling versus Looks Great. "The Toshiba packs the most power in the smallest case, and it's the best bet for the DOS-to-travel audience," argues executive editor Bill Howard. "You're crazy," counters executive editor Paul Somerson. "The screen on the Zenith is the first one on a battery-powered laptop you can read without risking your eyesight." "Yeah but," retorts Howard, "the Zenith isn't much smaller than Willard Scott." "Sez you," sneers Somerson. "You wouldn't be so fond of the Toshiba if Ziff-Davis didn't pay for eye exams." And so on into the evening.

**KEEN-SIGHTED CRITIQUES** The comments of *PC Magazine* editors—Howard, Somerson, PC Labs director William G. Wong, and editor Bill Machrone—appear as Counterpoints to this issue's reviews of six new laptop portables by frequent contributor Jon Pepper. We'll be including Counterpoints from time to time in future issues as well, to give you multiple perspectives on major new products. While there's no arguing with the impartial results of the PC Labs' benchmark tests, reasonable people can and will differ on ease of use, arrangement of features, or the wisdom of trade-offs made in the name of saving space or production costs—and that's where Counterpoints come in. Differing viewpoints have been important ever since the three blind men first reviewed the elephant. Hopefully, *PC Magazine*'s editors and reviewers have the big picture.

Also, in this, the final issue of 1986, we review several of the year's best new graphics packages, such as *Harvard Presentation Graphics* and the three-dimensional *Perspective*; the emerging field of presentation software for building demos, tutorials, and slide shows with animation represented by *Dan Bricklin's Demo Program* and *Show Partner*; and a look at two ultra-high-resolution monitors from Wyse and Moniterm tailor-made for CAD and the emerging PC desktop publishing arena.

In First Looks: Hands-on reviews of a breakthrough accounting program, *NewViews*, and what may be the first desktop publishing package for the PC, Xerox's *Ventura Publisher*, page 33.

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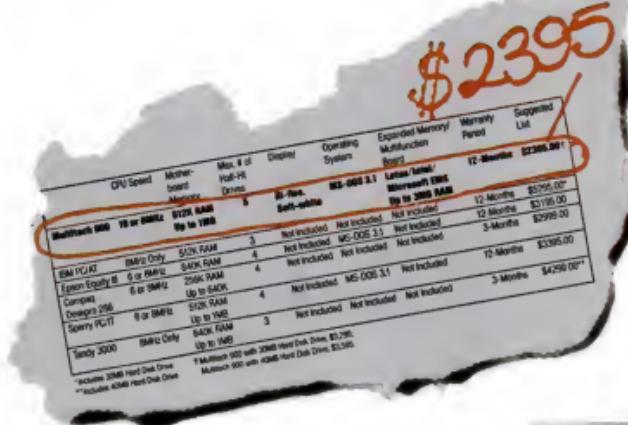
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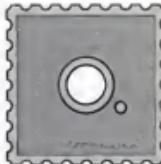
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# LETTERS TO PC MAGAZINE



## H-F COMPUTING RESPONDS

Thank you for the review of our product *HFTools for File/Directory Security* ("Protection from Prying Eyes," *PC Magazine*, Volume 5 Number 15). We



feel that Mr. Taylor did an excellent job and presented a fair and unbiased comparison of all four products.

Obviously, however, our pricing policy appears to require a short explanation. We have specifically targeted corporations and government agencies as the prime market for this product and, as such, have established a pricing structure that offers significant volume discounts. And for large corporations, we can negotiate corporate licenses that can drop prices below \$100.

With regard to his comment on the length of the name of our product, I'm afraid Mr. Taylor has discovered the only known bug in the system. To this we can only plead guilty; although we invented dozens of names, we found that most of the good ones were already taken, and we talked ourselves out of the rest.

Finally, please note that we have a new address: 191 Eglinton Ave. East, Toronto, Ontario, Canada, M4P 1K1.

Peter W. Howarth  
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Canada

## PC DREAM COMES TRUE

I had been dreaming that someone would give Mike Brown of Central Point Software an award for his contribution to the

industry with his *Copy II PC/Mac*, when *PC Magazine* came through again ("The Second Annual Awards for Technical Excellence: The Envelope, Please," *PC Magazine*, Volume 5 Number 4).

My company works hard to honor software license agreements, but many times we have had to restore a novice user's erased key disk or wrongly backed-up copy on/off utility. And in order to maintain our company's investment, we often have to back up copy-protected software that we must run in an asinine, unprotected read/write mode. However, your "this is how we see it" articles on copy protection, plus your detailed studies of utilities such as *Copy II PC/Mac*, have made you a valuable resource for my company and this industry. Thank you for honoring Mr. Brown.

David L. Lazar  
Olympia, Washington

## IS IT WORKING OR TICKING?

I was most intrigued by your article on the Adaptec ACB-2070A Hard Disk Controller (First Looks, page 46, *PC Magazine*, Volume 5 Number 16). The most interesting part was that the author says it works only with PCs, XT's, and some compatibles. I have been using the controller with my AT-clones for about three months now. I had no idea that it was not working.

Lewis E. Valentine  
West Palm Beach, Florida

Winn L. Rosch replies:

*As I mentioned in the article, Adaptec is working on a controller that will run with an AT, but right now it does not support the Adaptec ACB-2070A on ATs or AT clones. This is not to say that the controller will not run on an AT, but it could mean*

*problems for your system in the long run. Lack of support from the manufacturer makes the long-term reliability and data integrity of your system doubtful. You could be sitting on a time bomb.*

## WHO OWES WHOM?

Your review of *I-2-3* clones ("I-2-3 Knockoffs: How Close Do They Come?" *PC Magazine*, Volume 5 Number 17) was intolerable. Not only did the author write in a sarcastic tone, but he also skinned over all the significant improvements in the three products he reviewed. In addition, he was too lazy and lacking in sophistication to use the multidimensional feature in *VP-Planner*, and he ignored the fact that *VP-Planner* will run larger spreadsheets than *I-2-3* as the result of a cell memory allocation scheme. His comparison of the list price of *VP-Planner* to a used or discounted price of *I-2-3* was also intolerable.

As a reader, I demand factual, unbiased product reviews. I think you owe your readers and the authors of the fine *I-2-3*-compatible products an apology.

Chuck Yale  
Racine, Wisconsin

*Apology? In your ire, perhaps you failed to notice that we selected VP-Planner as our Editor's Choice.—Ed.*

## MORE CREDIT IS DUE

We at INS Corp. were very pleased to have our SDLC PC Adapter board selected as a *PC Magazine* Editor's Choice in your re-



# Boost cursor speed. Stop cursor run-on.

With all the recent hoopla over performance, it's ironic that two of the PC's ergonomic deficiencies—cursor speed and its slow cursor, and the tendency of the cursor to remain in motion (run-on) after a cursor key has been released. Finally, the solution—Cruise Control™ from Revolution Software.

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*"Once I used it, I wanted it! Excellent idea. Very practical. One of the best programs ever sent to us for review!"*

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cent evaluation of micro-to-mainframe connections ("Micro-to-Mainframe Connections: SNA Remote Emulation," *PC Magazine*, Volume 5 Number 16). The praise given to the INS SDLC PC Adapter for the simplicity and flexibility of its design was well received.

However, I would just like to point out two important features that were not credited to the SDLC PC Adapter in the summary of features table accompanying the article: screen capture to printer or disk and Application Program Interface (API) are both standard features on all INS PC adapter boards.

Katie W. Kennedy  
Marketing Manager  
INS Corp.  
Mobile, Alabama

### A BIT OF FRESH AIR

With so much garbage on the computer market—hardware, software, and publications—it's truly refreshing to read *PC Magazine*. Product reviews that let you know when junk is junk are fresh air to the reader used to the gutless overviews in buyer's guides and supermarket computer magazines.

I find myself reading entire articles on subjects that don't even interest me, just because they are so well written. But perhaps the most astounding fact is that you manage to do this every two weeks, keeping the product reviews timely, lively, and readable.

William H. Montague  
South Chatham, Massachusetts

### MAKE FIRST CHOICE SECOND CHOICE

I recently purchased a copy of Software Publishing Corp.'s new product *PFS:First Choice*, thinking it was an integrated, improved version of *PFS:File* and *PFS:Write* with communications and a spreadsheet thrown in. Since I had previous experience with Software Publishing's upgrades, I didn't hesitate to shell out \$150 for this product. In my opinion, it is the finest integrated package available. It is so user



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## ■ LETTERS

friendly it practically hugs your neck.

However, *First Choice* has a fatal flaw for owners of the *PFS:Write* and *PFS:File* packages—it will not address files from these older versions. I have been using *PFS:Write* and *PFS:File* for several years and have hundreds of files that will become totally useless if I adopt *First Choice*. The *First Choice* word processor will accept ASCII files; so it is possible to use old *PFS:Write* files if you are desperate, but the database section will leave you in the cold if you have existing *PFS:Files* files in the older format.

I have been told that *PFS:Write* and *PFS:File* users will be covered by the new *PFS:Professional* packages soon to be released. I am sure they will be fine products, but what about integration? Even Ashton-Tate provided a conversion program between *dBASE II* and *dBASE III*.

Richard L. Forand  
Douglasville, Georgia

*You are correct. PFS:First Choice will not address files from either PFS:Write or PFS:File. But according to the people at Software Publishing, First Choice was not intended to be an upgrade to PFS:Write and PFS:File. In fact, Software Publishing designed First Choice with the intention that it would eventually take the place of the other two products. However, the \$60 Professional Write and Professional File packages were designed as upgrades for PFS:Write and PFS:File customers, and the company feels that users looking to upgrade will be much more satisfied if they purchase these products rather than First Choice. You'll be glad to know, however, that Software Publishing is in the process of developing a conversion program that will allow you to enter PFS:File data into the First Choice file.—Ed.*

## BLEW OUR COVER

I truly enjoyed the September 30, 1986, issue of *PC Magazine*, which spotlighted the new scanners for text and graphics ("Page-to-Disk Technology: Nine State-of-the-Art Scanners," *PC Magazine*, Volume 5 Number 16). I was particularly impressed with the SpectraFAX 200's scanning capabilities, as illustrated on page 167; not only did it produce a recognizable image in color of the *PC Magazine*

cover, it also reproduced the mailing label that was no longer on the "original." A capability like this is every bit as useful as the undelete utilities that floppy and hard disk users have been using for years. I must say that technology never ceases to amaze me!

Timothy J. Ng  
Hyattsville, Maryland

*You caught us. The scanner obviously did not reproduce the missing mailing label. Unfortunately, the authors of the review were testing the scanner in California, and when we asked them to scan a PC Magazine cover, they used one of their own copies with the mailing label still on it. Meanwhile, back in New York we prepared a photograph of the same issue without a mailing label. We did not assume our readers would believe that the SpectraFAX scanner was magical, and based on your letter, we believe it is safe to say that we assumed correctly.—Ed.*

## CORRECTIONS

Solution Systems' PROLOG-86 Plus costs \$250 ("PROLOG: A Language For Artificial Intelligence," *PC Magazine*, Volume 5 Number 17). The \$95 cited in the accompanying Fact File is the price of the PROLOG-86.

The correct name and address of the manufacturer of Disk Mechanic is MLI Microsystems, P.O. Box 825, Carrollton, TX 75011 ("Easier than DOS DEBUG: Six Utilities for Byte-Level Editing," *PC Magazine*, Volume 5 Number 17).

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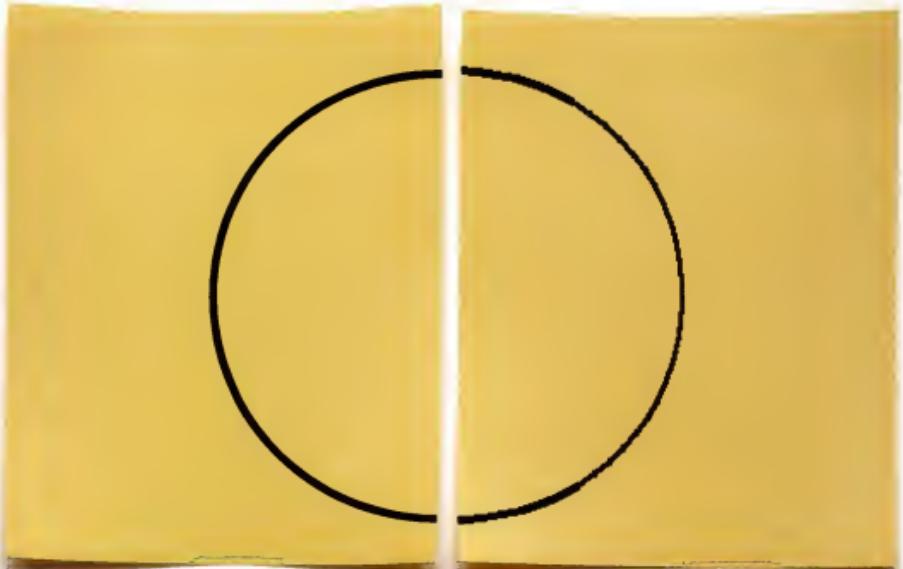
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**Windows for Data** comprises all of Windows for C but takes in data through the windows interface. All you need is a function interface to specify input string, field length, data type, screen location, picture, large variables, then sets lesser functions occurring to get and process a user's input. These are utilities to get system date and time, mess with strings, create your own masks for fields, etc.

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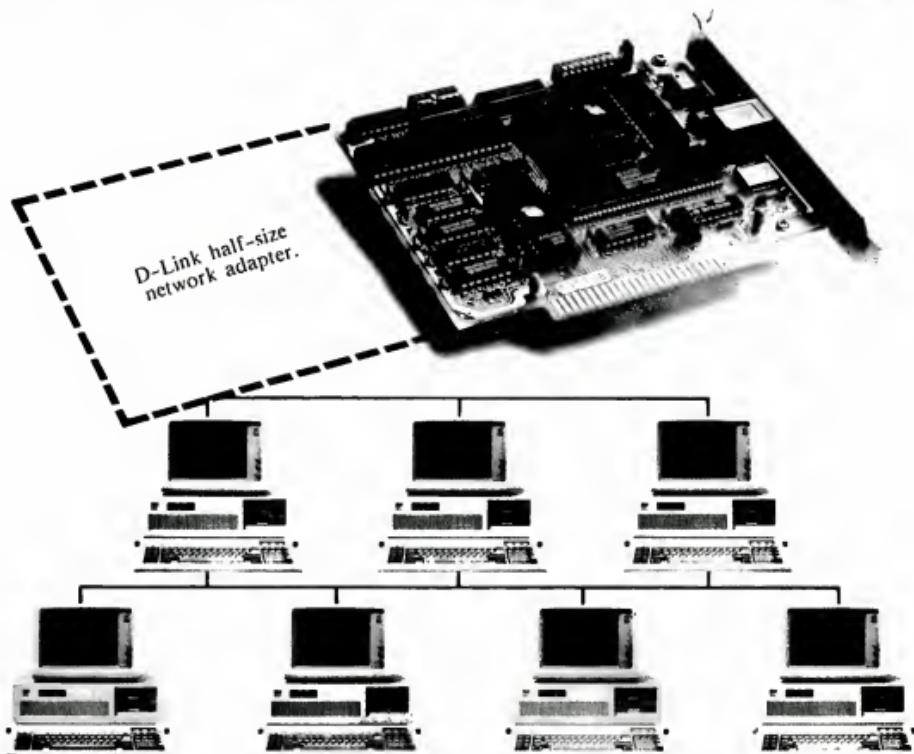
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MICRO EXPRESS PRESENTS



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XT hard disk controller	74
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■ GUS VENDITTO

# PC ADVISOR

*Help in overcoming IBM DOS 3.2's inability to read data on certain DOS-compatible disks and in turning off your cursor's incessant blink.*

## DOS 3.2 INCOMPATIBILITY

The following "polterbyte" activity has occurred twice in the past month. I select a disk that has not been used for a few months and put it into drive A: running DOS 3.2. With the first read, the message "File Allocation Table damaged" scrolls continuously until I reboot. When I try to read the disk on drive B:, the same message appears, just once, but all subsequent attempts to use drive B: fail until I shut down. Attempts to diagnose the mystery disk with CHKDSK fare no better.

When I boot with DOS 3.1, there are no problems, files can be listed, read, deleted, what have you. When I reboot DOS 3.2, the disk still acts like a floppy black hole.

Have I stumbled across some incompatibility between DOS 3.1 and 3.2?

Rod Morgan  
Gaithersburg, Maryland

*The only existing DOS incompatibility we know of is between IBM DOS 3.2 and some earlier DOSs not licensed by IBM.*

*The problem results from DOS 3.2's attempt to read the name of the manufacturer and the format of a disk from the BIOS Parameter Block, information which is contained in the boot sector of the disk (sector 0, track 0). Both IBM and Microsoft have specified that the name of the manufacturer appear within the first 8 bytes in this disk sector. Most DOSs include the letters IBM along with the version of DOS when formating information is written to disk in this sector. In earlier versions, DOS ignored this information; IBM's DOS 3.2 insists on finding it. When*

*it doesn't, DOS will refuse to read the disk.*

*Because IBM sells DOS under license from Microsoft, IBM can decide not to support non-IBM DOSs. There are no products now available to solve this.*

*There are two solutions. You can boot an earlier version of DOS and then copy all your files onto disks that were formatted under 3.2.*

*Or, if you feel comfortable using DEBUG, you can write the information DOS 3.2 wants to find onto the disks.*

*Load DEBUG from a DOS prior to 3.2:*

*DEBUG*

*Put a nonbootable disk that DOS 3.2 can read into drive A:. Type*

*L 100 00 1*

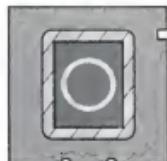
*Now replace the disk with the problem disk. Type*

*W 100 0 0 1*

---

■ The only existing DOS incompatibility we know of is between IBM DOS 3.2 and some earlier versions of DOS not licensed by IBM.

---



## QUIT DEBUG:

**Q**

---

## IN SEARCH OF THE SOLID CURSOR

I find the blinking cursor extremely distracting. I tried to use the User-to-User DEBUG program (*PC Magazine*, Volume 5 Number 12, page 288), but that routine totally eliminated my cursor. And when other programs such as 1-2-3 were used, the accused blinking cursor returned. Is there any software that will permanently change the blinking cursor to a solid underline?

Andrew Suhy  
Paris, Michigan

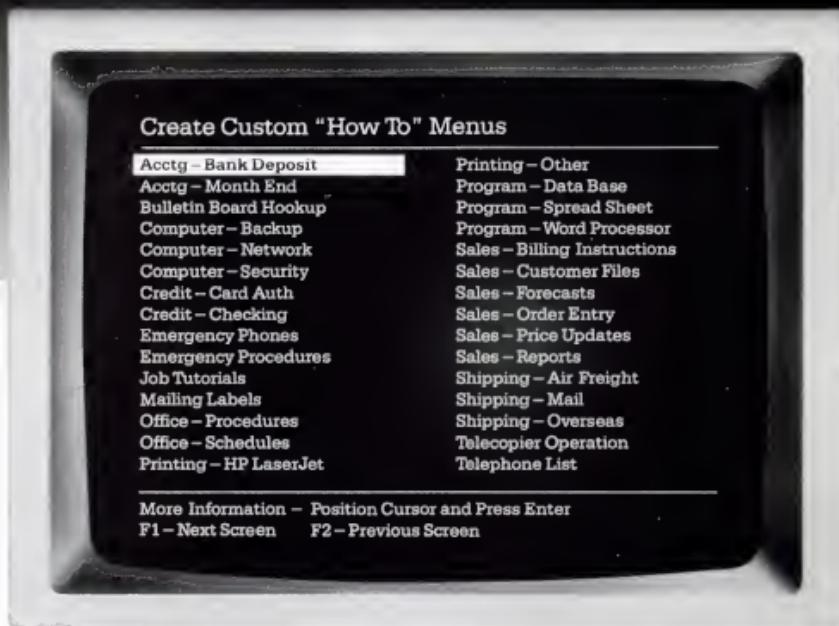
*The User-to-User column you refer to explained that, with experimentation, other characters could be substituted for the cursor, so you can adapt the routine to use an underline or any other character in the ASCII table as your cursor. But, as you pointed out, it's true that the routine is not compatible with 1-2-3.*

NoBlink/Accelerator (*Nostradamus Inc.*, Salt Lake City, Utah; (801) 261-0769; \$49.95) will let you turn off the blink, but you'll have to settle for a solid box instead. The program does let you select the cursor's color, however. It's compatible with 1-2-3, Smart, SideKick, WordPerfect, Framework, and others.

## ASK THE ADVISOR

Send your questions to the PC Advisor, *PC Magazine*, One Park Avenue, New York, NY 10016.

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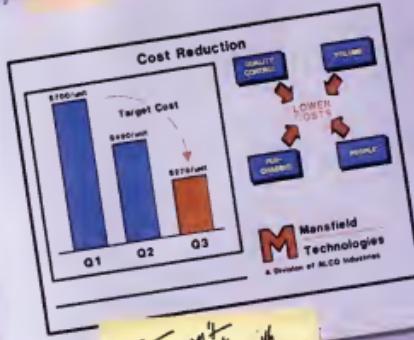
(In California 800/231-3531)

Toll-Free for Ordering Information for IBM PC/ATs and 100% compatibles.

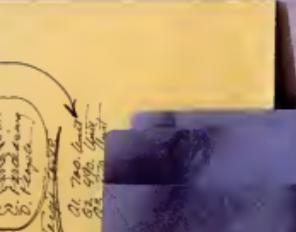
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SOFTWARE

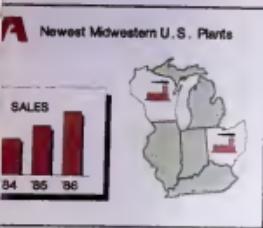
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Escondido, California 92025  
619/743-7800



Liz  
You won't  
believe what  
you can do with  
this stuff!



Lotus.

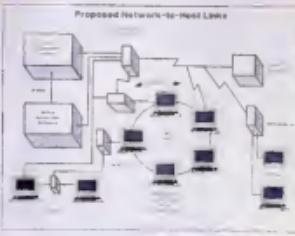


**From the Book of Jonathan Smith Manager, S&S Division**

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**Activity Planner**

NOVEMBER						
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29	30	31				



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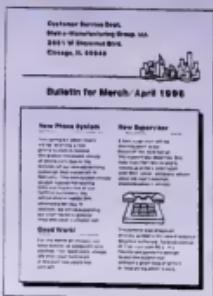
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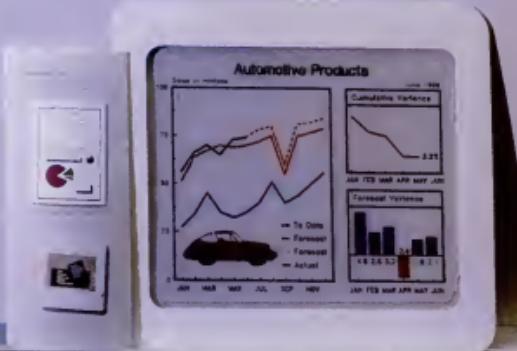
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# FIRST LOOKS

## NewViews: Breakthrough In Double-Entry Accounting

### PC HANDS ON

A nested-spreadsheet approach provides dynamic interaction among all parts of a company's books.

BY LOREN AMSDEN

By intelligently using the spreadsheet as a model, Q.W. Page Associates has created an amazingly flexible professional accounting package.

Called *NewViews*, this \$695 program provides payables, re-

ceivables, customer invoicing, financial statements, payroll, inventory—nearly any bookkeeping activity that lends itself to double-entry accounting.

The program's most unique feature is the way it lets you

look at your books using a structure of nested spreadsheets (*NewViews* calls each spreadsheet a document). The main menu for each set of books is actually a list of report names, such as Balance Sheet or Income Statement. Placing the cursor on Balance Sheet and commanding *NewViews* to "expand" the document brings the balance sheet to the screen. Each report looks just like its paper counterpart would, with a dated title at the top, line-item descriptions down the left-hand column, and the line-item amounts, subtotals, and totals in

the appropriate columns to the right.

### Cruise Through Reports

As you move through the report, scrolling left and right as well as up and down, you can expand any line item. In the Balance Sheet you might place the cursor on Cash in Bank, command *NewViews* to expand, and the bank account ledger will appear. Then you can scroll around the ledger, examining the transactions on it just as you navigated through the report. If any of the items at this level rep-

(continues on next page)

## Ventura: At Last, a Powerful Desktop Publishing Program

### PC HANDS ON

BY DIANE BURNS  
AND S. VENIT

*Ventura Publisher* may be the program that finally brings Macintosh-style desktop publishing capabilities to the IBM PC. Not only does *Ventura Publisher* offer the same easy-to-use features as the Macintosh—pop-down menus, mouse support, and WYSIWYG page display—but it goes the Mac one better with style sheets and other powerful features that will make producing long documents in handsome, well-organized formats a breeze.

*Ventura Publisher* runs un-

der a run-time version of Digital Research's *GEM* desktop operating environment (not surprising, since the developers of *Ventura Publisher* are renegades from Digital Research). This makes *GEM* transparent to the user. You run *VP* directly from DOS, without going through the *GEM* environment (see "Operating in a New Environment," *PC Magazine*, Volume 5 Number 4, for a full discussion of *GEM*).

The package runs on an IBM XT or AT with a graphics monitor (CGA or EGA). It supports a wide variety of printers, including the HP LaserJet, the Xerox 4045, and PostScript-compatible printers such as Apple's

LaserWriter, as well as electronic typesetters.

Downloadable fonts are included for the HP LaserJet Plus, so that users can take advantage of a wider variety of type styles than HP's cartridges now support. *Ventura Publisher* also provides a driver for the Xerox 4020 color ink jet printer, currently a somewhat unique feature among page-layout packages for the PC.

Xerox Corp. has purchased worldwide marketing rights to *Ventura Publisher*, so that users can benefit from Xerox's enormous support network. Unlike many other Xerox products, however, *Ventura Publisher*

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## New Views

(continued from previous page)

recent complex transactions (such as a single deposit that consisted of multiple checks), you can expand that line to display a distribution screen detailing the source and the amount of each check in the deposit.

Because the links between each level of this structure are live, the way that you view your data is also the way you edit it. For example, if you change the

### You can look at each document from several different angles

amount of a check on the distribution screen, when you contract your view back to the bank account ledger the amount of the transaction and the bank bal-

Status: Income Statement		10-25-85
Description	Amount	Date
Advertising	\$5,000.00	
Sherman Supplies	5,000.00	
Total Selling Expenses	10,000.00	
GENERAL EXPENSES	5,000.00	
Office Rent	10,000.00	
Office Salaries	2,000.00	
Office Supplies	1,000.00	
Taxes	2,000.00	
Depreciation	2,000.00	
Postage & Courier	1,000.00	
Total General Expenses	10,000.00	
Total Operating Expenses	15,000.00	
NET INCOME	133,370.00	
Description	Des:100.00 End:Dec 31.85 Type: A	

NewViews employs a spreadsheet format, but, because documents are nested or counts, can be reviewed dynamically through the pull-down menu choices.

ance will then have been changed accordingly, as will the Cash in Bank line (and the bottom line) on your balance sheet.

In addition, you can look at each document from several different angles, or views. The credit view of the bank account

ledger, for example, would show only the credit transactions, while the closed view would show only those transactions that had been marked as reconciled with the bank.

NewViews lets you maintain multiple sets of books by plac-

## Ventura

(continued from preceding page)

will be available in retail computer stores.

After you open a file, you lay out pages by drawing or defining a series of frames into which you place text or graphics. You can either enter text directly into *Ventura Publisher* or import it from a word processing package. In the latter case, *Ventura Publisher* maintains formats, such as bold and italic, that have been entered in the word processor. File formats directly supported include *MultiMate*, *WordPerfect*, *WordStar*, and *Microsoft Word*.

You can draw simple graphics in *Ventura Publisher*, or else import files created in other packages. Graphics packages currently supported are *GEM Draw* and *GEM Paint*, *AutoCAD*, *Mentor Graphics*, and *PC PaintBrush*. You can also import graphs from 1-2-3. Once graphics are imported, *Ventura Publisher* lets you easily size and crop them.

### Block Formatting

One of *Ventura Publisher's*



Ventura's WYSIWYG display lets you change or reposition text; all text changes are automatically reflected in the original text file on disk.

### Why All the Fuss About Desktop Publishing?

Desktop publishing has become such a catchall phrase of late that it's reminiscent of the promise of the paperless office and how printed

forms would disappear just as soon as computers were on everyone's desk.

The advent of desktop publishing came with laser printers and their resolution of 300 dots per inch—far better resolution than the 100 dpi produced by the standard dot matrix printers

ing the data for each set in a separate subdirectory of your hard disk or on a separate floppy disk. The only limit to the number of entries or transactions within a set of books is the amount of disk space available.

To control the extreme flexibility of *NewViews*, three levels of password protection are included.

*NewViews'* flexibility also extends to the way it lets you edit and manipulate your books. Q.W. Page Associates has chosen a 1-2-3-like command structure, in which the Slash key brings up a menu bar from which submenus can be pulled down. For *WordStar* users, all of the 'K and cursor commands from *WordStar* work as well. If you prefer to operate your pull-down menus with a mouse, *NewViews* will accommodate that preference, too.

### Pop-up Calculator

*NewViews* contains a procedural language that advanced

most powerful features is its use of style sheets. Style sheets consist of "tags" that define specific character and paragraph formatting. To format whole paragraphs or groups of paragraphs, click on the text (using a mouse or the keyboard's Enter key), then click on the appropriate tag name (displayed in a list down the left side of the screen). If the format assigned to a tag is changed, all text with that tag changes automatically.

*Ventura Publisher* also aids the production process by dynamically changing original text source files as edits are made on the page. Add to this automatic index and table of contents generation, and you have a tremendously powerful,

connected to most PCs. With a price range of \$6,000 to \$7,000, though, laser printers were not about to revolutionize any part of the American office.

But within the last year laser printers' prices have dropped into the \$2,000 to \$4,000 range without sacri-

## From Batch Processing to Real-Time Accounting

Just a few years ago, the suggestion that full-featured, flexible, real-time accounting software might be made to run on a personal computer would have raised eyebrows among skeptical accountants. Even expensive minicomputer and main-

frame accounting packages frequently operated in batch mode, updating the books from the day's transactions each night.

Accounting software for personal computers has been marketed almost universally in sets of modules—one each for accounts payable, accounts receivable, payroll, and so on. Although the modules shared data, their inability to run simultaneously on the same computer meant that PC account-

ing software was also constrained to batch processing.

Times have changed. By intelligently and creatively applying the metaphor of the spreadsheet to the profession in which the paper spreadsheet has been the primary tool for close to five centuries, Q.W. Page Associates of Toronto has created a truly universal, professional accounting tool for personal computers.

—Loren Amsden

users can use to automate repetitive operations. Several pre-written procedures are included with the package, among them a pop-up calculator and a pop-up calendar.

*NewViews*' manual is complete, but wordy and strangely organized (the chapter entitled "Basic Skills" is last). Novice users will find themselves rely-

ing on *NewViews'* extensive error-trapping capabilities and context-sensitive on-line help (both very good). Anyone with moderate experience keeping books who is not afraid of the keyboard should find it easy to get started.

The absolute minimum memory requirement is 128K bytes, although 256K is far

more practical for working on accounts of any real size. 640K is probably best if you have sizable records. Unfortunately, *NewViews* does not support the Lotus/Microsoft expanded memory specification.

For small and growing businesses requiring flexible accounting in-house, *NewViews* is a potential breakthrough prod-

uct. There is one limitation that will probably keep *NewViews* out of the defense industry and the federal government: the largest dollar amount it lets you enter is \$10 billion.

easy-to-use, and effective document processor.

*Ventura Publisher* includes a rich assortment of features, too many by far to mention here in our brief first look (a more in-depth review will appear in a feature article in *PC Magazine* in the coming months).

Suffice it to say that *Ventura Publisher* includes everything you would expect from a top-notch page-composition package. Kerning, leading, and hyphenation are all well implemented. Also implemented are jazzier features such as automatic wrapping of text around graphics. You can view a page in reduced mode (so the entire page is on-screen), actual size, or twice actual size while main-

The finished *Ventura* layout is superior when printed on a laser printer, though the program supports a wide variety of dot matrix printers as well.

ficing print quality.

New software programs are starting to realize the potential that affordable laser printers offer.

It's unlikely that desktops are going to produce very many annual reports, sales brochures, or promotional materials. Resolution is still

far off the mark (articles in *PC Magazine*, for instance, are printed by typesetters at a resolution of 1,800 dpi).

But in-house newsletters, sales reports, and leaflets for small stores could benefit greatly from the new wave of programs for the PC that *Ventura Publisher* is lead-

ing. In the next few issues, *PC Magazine* will have First Looks reviews of Aldus's *PageMaker*, Software Publishing's *Harvard Presentation Graphics*, and other soon-to-be-released page-layout programs in the \$600 to \$900 price range.

—Gus Venditta

## FACT FILE

### NewViews

Q.W. Page Associates Inc.

67 Balliol St.

Toronto, Ontario

Canada M4S 1C2

(416) 487-3424

List Price: \$695

Requires: 128K RAM (256K recommended), two disk drives, DOS 2.0 or later.

In Short: A dazzling accounting package that lets you look at and edit your books in flexible ways. Not copy protected.

CIRCLE 431 ON READER SERVICE CARD

taining the ability to edit interactively. After several weeks of use, we found the package quite reliable and intuitive to use.

At \$895, *Ventura Publisher* is a sound investment. It is an amazingly sophisticated package to have come out so early in the desktop publishing race. And the race, folks, has definitely begun.

## FACT FILE

### Ventura Publisher

Xerox Corp.

701 S. Aviation Blvd.

El Segundo, CA 90245

(213) 536-7000

List Price: \$895

Requires: IBM PC-XT or AT or compatible with EGA or color/graphics adapter.

In Short: Powerful page design software that uses style sheets to incorporate graphics and text into documents. Not copy protected.

CIRCLE 432 ON READER SERVICE CARD



The finished *Ventura* layout is superior when printed on a laser printer, though the program supports a wide variety of dot matrix printers as well.

# Freelance Plus Charts Data, Reads Worksheets, Supports Freehand Drawing

## PC HANDS ON

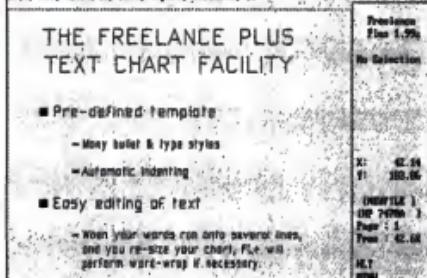
BY DAVID HOFFMAN

*Freelance Plus* is the first new graphics product issued by Lotus since it acquired the family of products developed by Graphic Communications Inc. (GCI) in June 1986.

A wide range of features has been integrated into this major revision to *Freelance 1.0*. Standard business graphs may now be created by entering data directly or by importing 1-2-3 worksheet (.WKS or .WK1) files (previously, *Freelance* worked with GCI's *Graphwriter* to create charts). Freehand drawing with a mouse or digitizing tablet is now possible. A variety of simple graphics elements may be combined into complex objects. The symbol library included with the program has been expanded, and several sets of map symbols are available as options.

You can create images on any standard PC with a graphics display and then output to a wide variety of media, including 35mm slides, overhead transparencies, laser printouts, and video. As in the original, all the conventional tools of the

Macintosh, MS-DOS, Novell, NeXT, VME, Options, File, Edit, Chart, Help menus.



In addition to extensive graphing functions, *Freelance Plus* has a variety of forms styling features including text sizing.

graphic artist are emulated. You can merge lines, rectangles, arcs, arrows, and polygons into charts; you can specify line thickness, color, and style. You can easily add and edit text and can output it in a variety of fonts. Any single element or group of related elements can be resized, copied, or moved.

With *Freelance Plus*, it's no longer necessary to create a graph prior to enhancing it; you can enter numbers or import from ranges or graphs that were defined within 1-2-3 .WKS and

.WK1, or *Symphony* .WRK and .WR1 files. The common graph formats are supported: pie, bar, column, line, and scatter charts. More than one chart can be incorporated into a single image. Elements of charts can be rearranged, and text and symbols can be added.

One of the nicest new features of *Freelance Plus* is its ability to create text charts, such as bullet charts. You can define templates for formatting text by specifying things like typefaces and sizes, positioning, indentation level, color, and bullet type. If a chart is resized in a nonuniform manner, text on continuous lines is automatically word-wrapped. *Freelance* has always allowed for entering, positioning, and sizing text; the new charting abilities automate and standardize these functions, allowing you to concentrate on content instead of form.

A new feature allows use of a mouse or other input device for freehand drawing. You can trace an existing graphic or create detailed symbols and diagrams. Freehand images can be rescaled and edited just like other images.

An important improvement in *Freelance Plus* is its ability to connect different elements in an

image. You can build a complex polygon from simpler elements such as lines and arcs.

In addition to the tools *Freelance Plus* provides for creating original images, the program includes its own modifiable library of nearly 500 symbols. Road signs, flags, and illustrations of computer equipment are among the common symbols offered. Lotus has also announced several sets of map symbols (available for \$145 each).

The need to merge graphics with text is a growing concern in business and desktop publishing applications. *Freelance Plus* provides a utility for outputting its images in *Metafile* format, which will allow graphics to be imported into Lotus's new document processor, *Manuscript*, and any other product that supports *Metafile* format.

Lotus will still market two earlier products in the graphics "family." *Freelance 1.0* will be sold for \$395, although current users can upgrade to *Freelance Plus* for \$100. *Graphwriter*, a program with charting capabilities beyond 1-2-3 or *Freelance Plus*, will still be sold for \$395.

## PC FACT FILE

### *Freelance Plus*

Lotus Development Corp.  
55 Cambridge Pkwy.  
Cambridge, MA 02142  
(617) 577-8500.

List Price: \$495 (\$100 upgrade fee for registered users of *Freelance 1.0*).

Requires: 384K RAM; Hercules Graphics Card, CGA, or EGA.

In Short: A major revision to *Freelance*, incorporating charting capabilities and the ability to read from worksheet files. Not copy protected.

CIRCLE 489 ON READER SERVICE CARD

## Why Freelance Became a Lotus Product

When Graphic Communications Inc. of Waltham, Massachusetts, introduced its second business graphics product for the PC, *Freelance*, the program was, on the surface, simply a complement to the company's moderately successful charting program, *Graphwriter*.

But when 1-2-3 users saw how readily *Freelance* could manipulate graphics generated by Lotus's 1-2-3 and *Symphony*, sales took off.

*Freelance* became the solution for 1-2-3 and *Symphony* users who complained that while Lotus's spreadsheets were good at turning numbers into graphs, those graphs were crude and begged for customization.

Lotus was also aware. The following June, the company acquired GCI, which had already begun work on *Freelance Plus*.

Lotus filled a key niche in its product line, while GCI's products received the marketing and development resources that only a company of Lotus's size could supply.

—David Hoffman

Free 30-Day Trial!

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# End Financial Hassles. \$49.



BEFORE QUICKEN: Who doesn't want to get rid of the hassles of paying bills, managing finances, and keeping records?

If you write checks, you need Quicken—the breakthrough software that automates financial management for business and home.

**The breakthrough is Quicken's fully automatic design.** Quicken is so automatic; it remembers your recurring bills and pays them—all you do is sign the checks. Automatic macros cut laborious data entry down to two keystrokes. Quicken manages your checkbooks and even finds and fixes your mistakes. It tracks and totals your expenses by date, payee, and category.

Quicken is so completely automatic it remembers to save and backup your data, even if you forget!

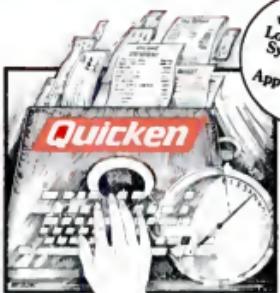
And if you use Lotus or AppleWorks, Quicken will automatically fill in your spreadsheets with your financial data!

**Quicken does the paperwork for you.** It's bill-paying time. Fire up Quicken and the screen looks just like a check. Your first bill is the bank loan, you press two keys and, zap, Quicken's macros write out the full check. Next, the American Express bill. It's a bigger. You're glad Quicken knows exactly how much cash you have. Macros write the check, letting you pick how much to pay. You slip paper checks in the printer. Don't bother positioning them, Quicken does that for you! Sign the printed checks and slip them into Quicken's window envelopes ...you're done.

**Compatibility:**

IBM® PC, XT, AT, PCjr., and compatibles with 160K RAM and one or more floppy disk drives or hard disk. Any printer. No modem required. 3-1/2" and 5-1/4" Symplicity optional.  
Apple® IIgs, IIc and IIe (Requires extended 80-column card), with one or two floppy disk drives, or UniDisk™ 3.5. Any printer. No modem required. AppleWorks optional.

Product names are trademarks of their respective manufacturers.



AFTER QUICKEN: Finally, automate your finances with software so fast and so automatic that time and hassles evaporate.

**Recordkeeping? That's done for you.** With each bill, Quicken filled out your records, updated all balances, and saved it all on disk. Need to record a check you wrote at the store? No problem, Quicken's macros update your records in an instant. Expense tracking, tax reporting, budgeting? Simple. Say you want to know your charity spending. Ask Quicken, and you get an itemized list and dollar total. You'll always know exactly where your money is going. Want spending for Job 104 or Account 3072? The answers are just keystrokes away.

**Need cost reports, P&L's or other financial reports?** Set up the spreadsheet you want in AppleWorks or Lotus\*\* 1-2-3 or Symphony. Quicken's ingenious Spreadsheet Transfer actually reads your spreadsheet and fills in the numbers you want, where you want them.

Dread reconciling the checkbook? Quicken makes it simple. And you can't go wrong: If there's a mistake, Quicken will pinpoint the error and automatically correct for it!

## Quicken

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## CRITICS HAIL A BREAKTHROUGH



—InfoWorld Review Board

"It's more than good—it's indispensable.  
Home and small business checking software  
used to be too expensive, too hard to use, and too  
rigid, and it took too long to use. Quicken has  
changed all that."

—Ken Lands, A+ Magazine

## FREE! TAX REFORM ANALYZER™

The Tax Reform Act of 1986 is the biggest tax change in 50 years. What should you do to save money now?

Find out fast with Quicken's new Tax Reform Analyzer—a disk of powerful worksheet templates to use with Lotus 1-2-3, Symphony, Multiplan®, SuperCalc® or Appleworks. And it's free, just for trying Quicken.

Just type in the key numbers from your last 1040 return. Tax Reform Analyzer shows where the new law affects you and the dollar change in your tax bill. Next it lists what specific actions you can take and the tax dollars you'll save.

Try Quicken for 30 days. If you return it, Tax Reform Analyzer is yours to keep (offer expires 1/1/87). Details are also in specially marked boxes of Quicken.

For every business and home—for computer experts and total novices, Quicken handles an unlimited number of transactions and accounts. Personalized checks are available for any bank; details are in the Quicken package.

**At \$49, Quicken pays for itself.** So don't waste another moment. Order now and get the new Tax Reform Analyzer free.

Intuit

# Easy-to-Use Software Distinguishes Microtek's 200-dpi OCR/Scanner

## PC HANDS ON

BY TOM STANTON

A whole new series of optical character readers (OCRs) and scanners is emerging, and the MS-200A SmartReader produced by Microtek is one of the more appealing offerings. While the MS-200A's 200-dots-per-inch resolution places it in the midrange of scanner resolution, the EyeStar image-processing software makes this product one of the easiest I have ever used.

The MS-200A measures 15 by 4½ by 17 inches, with a single-sheet feeder located near the front. Microtek has just announced an optional sheet-feeder attachment that can handle up to 50 single sheets, increasing the MS-200A's attractiveness for OCR production work.

The MS-200A comes with a parallel interface card that uses hex addresses 200 and 201 as a default; users can modify switches on the card and software addresses as needed. An optional serial (RS-232) attachment is available for systems short on slots. Microtek's software supports the Hercules Graphics Card, the Tecmar Graphics Master, the IBM Color/Graphics Adapter, and Mouse Systems' PC Mouse.

Dot matrix printer support is limited to the Epson FX-100 or compatibles. Laser printer support is more extensive, though. Microtek's software supports the Corona LP300, the Canon LBP-8 A2, and the Hewlett-Packard Laserjet and LaserJet Plus.

The EyeStar program, which handles graphics, is intended to be the main program interface: image scanning, manipulation, and merging text with graphics are all performed within the EyeStar environment. The OCR program, ReadRight, is licensed from OCR Systems and runs standalone.



*Microtek's software 200A lets you examine each scanned image in detail. The smaller window (upper right) is used to position the viewing frame.*

EyeStar's main menu displays an image window and four main selections: scan, process image, mix text and graphics, and user-defined functions. After a few minutes of experimenting (without consulting documentation), it's easy to scan, manipulate, and store an image file. With the documentation and a little practice, you can achieve great results in 1 hour.

Before scanning, you have to select settings for contrast, brightness, scale, and grain (gray-scale level). You can save settings to files and recall them as needed. You can position up to four scanning windows so that only portions of a page are processed. Images are held in a working file and can be manipulated or scanned over again before being saved permanently.

The Process Image menu allows you to zoom in on detail and enlarge, reduce, flip, rotate, select, cut, paste, copy, or merge images using various window combinations. EyeStar also includes a paint function that allows some rudimentary image alteration; you also can use PC-Paintbrush or GEM Paint for more-detailed editing.

### Scales of Gray

EyeStar does an exceptional

job with photographs and other continuous-tone images. Instead of using a fixed half-toning process, Microtek uses gray scales to represent shades of gray so that images can be scaled without loss of gray details. Thus an 8 by 10 photo can be scanned at 50 percent and yet have the same level of quality in gray tones as it would at 100 percent.

ReadRight is one of the easier OCR programs I've used. You don't have to specify the font because ReadRight uses a form of feature extraction instead of matrix matching. While it cannot read typeset proportional fonts, it can read most letter-quality and good-quality dot matrix fonts.

The OCR menu offers contrast and darkness settings to adjust for the quality of the original, and a frame setting that masks out graphics areas, such as letterheads, to increase scanning efficiency. I tried a variety of test sheets, and ReadRight handled all of them with little effort. I forgot to use the frame setting to mask out a letterhead (a 1-inch green field), and ReadRight was overwhelmed by the data density and just stopped, hanging the system.

My only disappointment with ReadRight is the limited

number of output file formats that it can directly write to. The menu selections are WordStar, WordPerfect, and ASCII. A second program, called Forad, converts from these formats to MultiMate, Displaywriter, Symphony, PFS-Write, WordStar 2000, and PC-Write. However, Forad, a memory-resident program, is prone to conflict with anything else you might be running.

### Can't Run Together

Even with 640K bytes of main memory I had conflicts trying to run EyeStar, ReadRight, and Forad together. I had an image file in a window, recalled the EyeStar menu, ran ReadRight from EyeStar, and found I had run out of memory for scanning (360K bytes is the minimum required). This means that ReadRight and EyeStar cannot be run together, a fact that is not made particularly clear in the documentation. Microtek would do well to create some user notes that discuss how best to use these two programs together.

Otherwise, the MS-200A offers exceptional features for the price. If you are looking for an all-purpose system that is easy to use, you've found it.

## PC FACT FILE

### MS-200A SmartReader

Microtek Inc.  
16901 Southwest Ave.  
Gardena, CA 90247  
(213) 321-2121

List Price: \$1,795  
Requires: 384K RAM, hard disk drive, graphics adapter, DOS 2.0 or later.

In Short: A good medium-resolution scanner with very flexible and easy-to-use software.

CIRCLE 409 ON READER SERVICE CARD

# Interoffice Memo.

A single MaynStream™ backs up  
all the PCs in your office,  
file by file!



## Protecting Files: Top Priority.

Hard drive users learn fast how indispensable tape backup really is. But equipping each of your PCs with its own backup system is a costly way to go. That's why we developed the MaynStream, our lightning-quick, *file-by-file* tape backup. When you've backed up one PC, just detach the MaynStream's Quick-Release Cable and snap it onto any other PC equipped with a low-cost MaynStream controller. Simple menus will guide you through another backup in seconds. And restoring data is just as easy. So when your hard drive forgets to treat your files like your business depends on them, the MaynStream remembers.

## Other Powerful Systems for the PC.



## Backup That Won't Back Down.

The MaynStream is small, lightweight, and big on performance features. Its rugged design and convenient carrying handle make multi-PC backup a breeze. And talk about fast! Backup takes just 3 minutes\* for the average 10MB drive (that's *file-by-file*, and it's still faster than the now antiquated image mode technology)! The MaynStream uses handy data cassettes small enough to slip into your shirt pocket. Available in 20 and 60 MB models.



MaynStream internal,  
available in both  
20MB and 60MB  
models.

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internal, available in  
60MB model.

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Sold at the finest computer stores. Contact your local dealer or write to us today for product information.



# Maynard Electronics

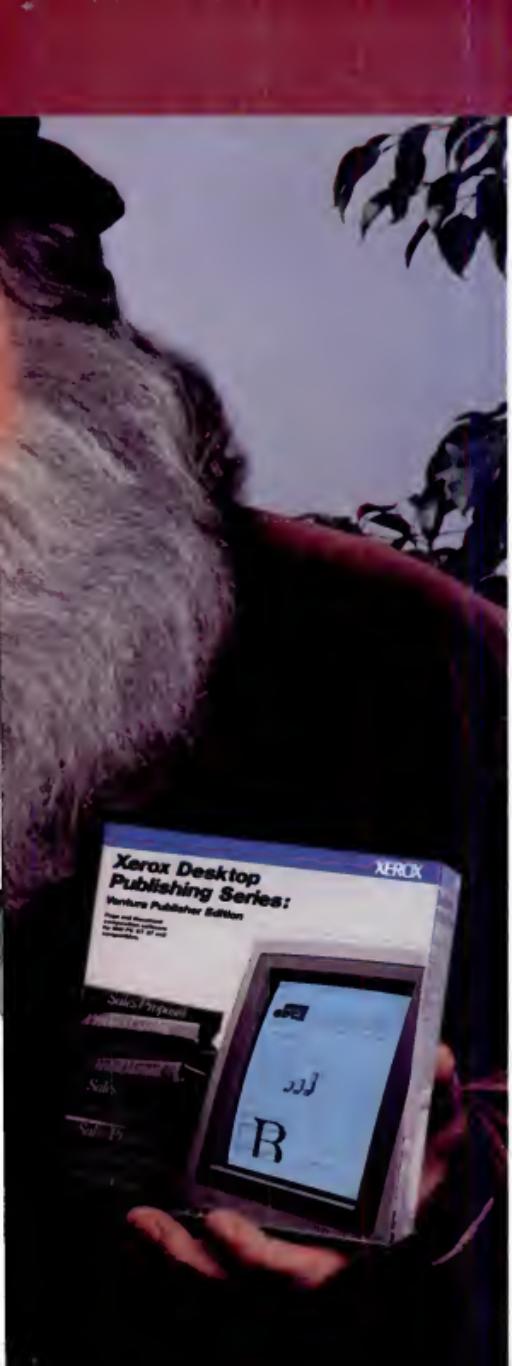
Shaping tomorrow's technology.

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460 E. Semoran Blvd., Casselberry, FL 32707 305.331.6402

\*Actual time: 2min.57sec. Total files backed up: 376 consisting of 10,002,432 bytes. Computed on IBM PC with 512K memory and one 10MB hard disk drive. Your actual backup time may vary. IBM PC is a trademark of International Business Machines.



A black and white photograph showing a person's hand holding a Xerox desktop publishing software box. The box is titled "Xerox Desktop Publishing Series: Ventura Publisher Edition". In the background, there is a painting of a lion's head and some foliage.  
**XEROX**

## Now, desktop publishing software of such genius, you don't have to be a 'Leonardo' to use it.

Until now, if you were in the IBM PC world and wanted to join the desktop publishing revolution, the software was hard to use, expensive, and often rewarded you with documents that were technically correct, yet visually disappointing.

Enter Xerox genius for creating perfect documents and a new generation of desktop publishing software—Xerox Ventura Publisher. It combines the best of current page-oriented systems with the best of document-oriented systems to make desktop publishing easy as well as productive.

The special genius of Xerox Ventura Publisher is "stylesheets"—20 built-in formats that arrange text and graphics automatically. Choose a stylesheet (or create your own), combine your text and graphics, and Xerox Ventura Publisher goes to work at the amazing rate of 20,000 characters per second, formatting as many as 64 100-page chapters. Most other programs format a page at a time, just like the cut-and-paste process you're escaping.

It's easy. You manipulate text and graphics with a mouse. What you see is what you get when you print. (Buy a new Xerox full-page display, and you won't have to scroll to see your entire page layout.) Make a change on page 1 and before you can say "Leonardo da Vinci," the entire document reformats. Tables of contents, indexing and numbering of pages, sections, tables, captions and figures are automatic.

Unlike most other programs, Xerox Ventura Publisher runs on a standard IBM PC XT/AT or compatible—AT power is not required. Text can be created on, and converted from, most major word processing programs. Graphics can be imported from many graphics and paint programs—even scanned images are easily incorporated. It supports dot matrix, color ink jet and laser printers as well as PostScript printers and typesetters.

What price genius? The money you'll save by producing your very first 16-page booklet instead of sending it out will probably cover the cost of your very own Xerox Ventura Publisher software.

**Xerox brings out the genius in you.**

**TeamXerox**

Xerox Corporation, P.O. Box 24, Rochester, NY 14692.

143B

Begin your career as a desktop publishing "Leonardo" by stopping in at any computer store featuring Xerox desktop publishing software, by calling your local Team Xerox sales office or 1-800-TEAM-XRX, ext. 143B.

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STATE \_\_\_\_\_

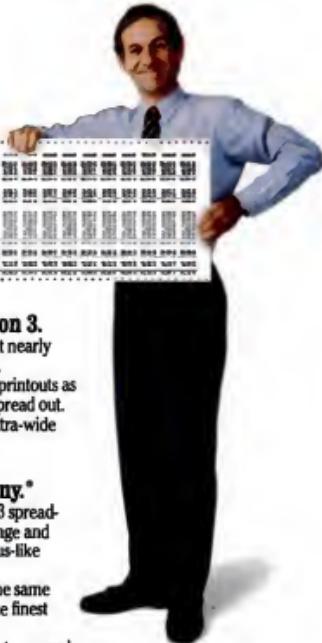
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143B-12/23-86

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**CIRCLE 480 ON READER SERVICE CARD**

# We've gone to great widths to make you look good.



## Introducing New SIDEWAYS® Version 3.

Sideways has always been the favorite way to print nearly everything that's too wide for a printer. Not surprising. It's quick. It's easy. And it makes clean, one-piece printouts as wide as you like. So you get spreadsheets that really spread out. Pert charts that peer far into the future. All kinds of extra-wide reports without staples, glue or tape.

But now Sideways Version 3 goes even further.

### Especially for 1-2-3® and Symphony.\*

Now you can make short work of those wide 1-2-3 spreadsheets. No need to make print files. Just highlight a range and print right from your worksheet file using familiar Lotus-like menus.

Mix bold, underlined and expanded type, all on the same page. Print through or skip over perforations. Make the finest extra-wide printouts this side of typesetting.

Using Symphony? Sideways chimes right in to print any worksheet you've loaded without ever leaving your Symphony session.

### No matter what software you use.

Spreadsheets, databases, word processors, project planners. Whatever you use, you'll get more out of new Sideways.

Choose from nine different type sizes, from "minuscule" to "mammoth." Print bold, underlined or expanded - whatever your software can create. Even foreign language and line-drawing characters. Plus, there are so many ways to adjust margins, spacing and page size, it stretches the imagination.

Sideways Version 3 for the IBM® PC and all popular dot-matrix printers. Available now at computer dealers nationwide. Or directly from Funk Software with your check, Visa or Mastercard.

At just \$69.95 a copy, you'll never want for width again.



Funk Software, 222 Third Street, Cambridge, MA 02142. Phone (617) 497-6339.

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CIRCLE 317 ON READER SERVICE CARD

## ■ COMMUNIQUES ■ EDITED BY BILL HOWARD

**Teachers' Pet Peeves**

Instructors' comments to PC fundamentals classes at a Texas-based Fortune 500 company:

- "One-fingered typists are going to have trouble with the next command. It's called a 'warm boot.'"

- "The paper light will go on after you run out of paper."

- "The on/off switch at the back of the printer is your first clue that the manufacturer did not have you in mind."

- "You Employee Relations types will love this next 1-2-3 feature: it's called Title Lock."

- "To a student in a 1-2-3 course: 'Yes, the little roof over the 6 key will center the text.'"

**How Many Dim Bulbs Does It Take To Screw Up a PC?**

More PC-related light-bulb jokes:

- "How many dBASE programmers does it take to screw in a light bulb?"

- "Three. One to write the light-bulb removal program, one to write the light-bulb insertion program, and one to act as light-bulb administrator to make sure nobody else tries to change the light bulb at the same time."

- "How many computer-science professors does it take to change a light bulb?"

- "Only one, but he'll write six journal articles about it."

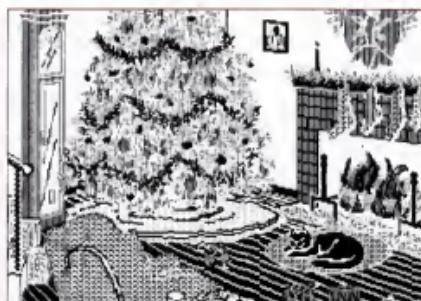
**Getting IBM on the Phone****PC HANDS ON**

BY GUS VENDITTO

Getting precise information from IBM Corp. is a task that only a Kremlinologist can appreciate. After a few phone calls, the source of a Proprietary platen replacement in Baltimore can seem like more of a



*Personics, maker of SmartNotes, clearly understands how floppy disks are treated in a world of sloppy PC users. This international guide to the proper care of disks, which appears on Personics desk sleeves, could generate the same fears that Saturday morning cartoons do in some quarters—don't give them any ideas.*



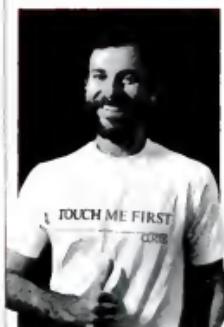
*Fight back against the crack epidemic: keep your kids occupied at home by teaching them to make greeting cards on the PC. The 1986 version of Jingle Disk from Hi Tech Expressions (2699 S. Bayshore Dr., Coconut Grove, FL 33133) runs \$9.95 for a kit to make seven different cards or pictures.*

information was gleaned from numerous telephone directories and is still somewhat vague.

You may not get the information you need on your first call, but for anyone who regularly needs parts, service, or a straight answer from IBM, the *IBM Master Locator* can significantly cut the number of calls you'll make before you hear a properly authorized IBM representative give you the number of the correct properly authorized IBM representative. ☐

**Microsoft Joke of the Week**

Microsoft's 1987 desk reference and appointment calendar lists Yom Kippur twice: April 14 (when Passover falls) and Oct. 3. Perhaps after all the glitches in Microsoft's pricey *MS-DOS Technical Reference Encyclopedia*, 2 Days of Atonement are in order.



*Want to meet new people? Try this T-shirt promoting Curtis Manufacturing Co.'s \$39.95 static discharge mat.*

*Heard or seen anything offbeat, unusual, or just plain dumb about the computer industry? Send your offerings to Communique, PC Magazine, One Park Avenue, New York, NY 10016; (212) 503-3293 or MCI Mail 157-9301.*

*Contributors will receive \$50 and a PC Magazine T-shirt. Contributors to this issue include Ellen E. Frazier (PC classes), John E. Johnson III (light-bulb jokes), and Edward Kivell (Microsoft calendar).*

**FACT FILE****IBM Master Locator**

The Brighton Group  
500 E. Brighton Ave.  
Syracuse, NY 13210  
(315) 476-3000  
Cover Price: \$49.95  
Copyright: 1986

CIRCLE 409 ON READER SERVICE CARD

■ NEW ON THE MARKET ■ JONATHAN K. MATZKIN



**Intel, American Computer Introduce 386 Turbo Boards To Speed Up ATs**

High introductory prices and lack of available software for 386 PCs may prevent users from immediately taking the plunge. The 386-based accelerator cards provide for a less expensive introduction to the brave new technology.

Intel Corp.'s \$2,495 In-board 386/AT comes with 1 megabyte of on-board RAM and operates at 16 MHz, allowing it to run existing applications programs twice as fast as an 8-MHz IBM PC AT. A memory cache makes use of the speed that the 80386 provides. Control software exploits the 80386 Virtual-86 mode, letting users run several applications programs simultaneously without software changes.

American Computer and Peripheral's 386 Turbo card, \$1,995, increases performance up to 400 percent, the company says, and supports software written for the 386 chip, as well as 80286-based programs. The card contains 1 megabyte of onboard RAM and brings a 6-MHz PC AT up to 12 MHz, and an 8-MHz machine up to 16 MHz, through the use of frequency-doubling circuitry.

**List Price:** Inboard \$364/AT, \$1,995; with 1 Mbyte memory, \$2,495; daughterboard with 1 Mbyte of additional memory, \$645; daughterboard with 2 Mbytes of additional memory, \$1,145; 10-MHz 80287 math coprocessor, \$495. Intel Corp., Mail Stop TOD-07, 5200 NE Elan Young Pkwy., Hillsboro, OR 97124; (503) 681-8080.

**CIRCLE 443 ON READER SERVICE CARD**

**List Price:** American Computer and Peripheral 386 Turbo, \$1,995. American Computer and Peripheral Inc., 2720 Croddy Way, Santa Ana, CA 92704; (800) 448-3448 or (714) 545-2004.

CIRCLE 444 ON READER SERVICE CARD

## HOT PROSPECT

### **Ashton-Tate Introduces Rapidfile: Easy-to-Use Database Manager**

**Ashton Tate's \$395 *Rapidfile*** is intended for users who want to manage data, create reports, write form letters, and generate mailing labels but don't need a full-powered database manager. *Rapidfile* includes *dBASE*-like pull-down menus and a 1-2-3-like interface and command structure. Data is displayed and printed in a variety of layouts, and the

program supports five field types, including alphanumeric, numeric, report, date, and calculated. *Rapidfile* can use dBASE III files.

**List Price:** *Rapidfile*, \$395.  
**Requires:** 256K RAM, two disk drives. Ashton-Tate,  
20101 Hamilton Ave., Tor-  
rance, CA 90502; (213) 329-  
8000.

CIRCLE 434 ON READER SERVICE CARD

*Ashton Tate's Rapidxfile, \$395, has multiple layouts that allow data to be viewed from a variety of perspectives. Up to 250 formats may be stored and reused.*

clude store-and-forward memory for broadcasting, automatic dialing, and a journal that keeps track of all communications. The 9,600-bit-per-second fax modem transmits a page in approximately 30 seconds. The board also features a second Hayes-compatible modem that operates at 1,200 bps for ASCII transmissions.

**List Price:** Datacopy Microfax, \$1,195. **Requires:** 640K RAM. Datacopy Corp., 1215 Terra Bella Ave., Mountain View, CA 94043 (800) 821-2898.

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CIRCLE 445 ON READER SERVICE CARD

**Peripheral-Maker AST  
Unveils AT Compatible:  
10 MHz, No Wait States**

With the Premium/286, a switchable 6/8/10-MHz 286 machine, AST Research has gone beyond computer enhancement products. The Premium/286 is available in five configurations. Each has a 1.2-MHz floppy disk drive and a floppy/fixed disk controller.

The base Model 80, \$1,995, adds 512K bytes of RAM. The other models all offer 1 megabyte of RAM, as well as an EGA. The Model 120, \$2,995, comes equipped with a 20-megabyte hard disk, and the Model 140, \$3,495, provides a 40-megabyte drive. The top-of-the-line Model 170, \$3,995, adds a 70-megabyte hard disk.

Two of the Premium/286's seven expansion slots are AST "FASTslots," capable of running without wait states at any of the three available clock speeds. AST says the computers were designed for single-user or multitasking applications and for use as engines in multiuser and applications-oriented workstation environments.

The Premium/286 is also the core of AST's Premium Publisher, a desktop publishing workstation. The system does include the AST TurboScan optical page scanner, the AST TurboLaser printer, and several board-level enhancement products.

**List Price:** AST Premium/286, Model 80, \$1,995; Model 90, \$2,495; Model 120, \$2,995; Model 140, \$3,495; and Model 170, \$3,995. AST's Premium Publisher, Model 1, includes Premium/286 computer, monochrome monitor, AST TurboScan scanner, and AST

Turbo-Laser printer, \$9,995. Model 2, the same as above except that it does not include scanner, \$7,995. AST Research Inc., 2121 Alton Ave., Irvine, CA 92714; (714) 863-0181.

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*The Premium/286, \$1,995, is a switchable 6/8/10-MHz 80286 computer that stands alone or anchors the Premium Publisher, AST's new desktop publishing system.*

### **CMS Introduces Add-On Tape Backup for PC-XT 286 And Deskpro 386**

CMS has introduced two external tape backup systems for the IBM PC-XT 286 and the Compaq Deskpro 386. The T-120, \$995, has a 20-megabyte capacity and the T-160, \$1,595, holds 60 megabytes. Both use  $\frac{1}{2}$ -inch tape cartridges for hard disk backup, program loading, and off-line data storage.

The drives have streaming,

file-by-file, and random access read/write modes to give users a range of mass-storage options. Transfer rate is 90 Kbytes per second, and tape speed is 90 inches per second. They come in self-contained cabinets with built-in power supplies.

**List Price:** T-120 tape drive, \$995. T-160 tape drive, \$1,595. CMS, 3080 Airway Ave., Costa Mesa, CA 92626; (714) 549-9111.

CIRCLE 440 ON READER SERVICE CARD

### **Epson, Citizen, Sperry Introduce Laser Printers Into Expanding Market**

Epson America and Citizen America Corp. have released products to join the growing number of under-\$2,500 office laser printers on the market, while Sperry Corp. has introduced a more

expensive, higher-capability unit.

Epson's \$2,495 GQ-3500 uses a Ricoh print engine and prints at a rate of six pages per minute. Emulations include Epson's letter-



*The Overture 110, \$2,395, is Citizen's entry into the market for under-\$2,500 laser printers. It has 512K bytes of internal memory and prints 10 pages per minute.*

quality dot-matrix series of printers with ESC/P code sets, as well as Hewlett-Packard's LaserJet Plus and Diablo Systems' 630 ECS, using optional plug-in emulation cards. The printer's 470K bytes of standard user memory lets users print half-page graphics at 300 dots per inch. A 1.5-megabyte expansion board allows printing of full-page graphics at 300 dpi.

Citizen's \$2,395 Overture 110 uses Mita's print engine to print 10 pages per minute. It features 512K bytes of memory for graphics and emulates the Epson FX-286, Diablo 635, and IBM Proprietary.

Sperry's \$3,500 Model 37 Laser Printer prints at 10 pages per minute and comes with 1 megabyte of memory.

### **AT Compatibles from Telex, Wintech, Diros Join Crowded 80286 Class**

The 80286 parade gets longer as three machines join the march. Telex Computer Products' Telex 1260, with a base price of \$2,485 with 256K bytes of RAM and an 80186 processor, is IBM PC-XT compatible. The 1280, \$2,990 with 512K RAM, features a switchable 6-MHz/10-MHz 80286 and up to 2.1 megabytes of RAM on the system board. Telex claims performance 30 percent faster than an 8-MHz IBM PC AT, when the 1280 runs at 10 MHz.

The Rostech PC 286, from Diros Marketing, at a base price of \$2,053, has switchable clock speeds of 6 or 10 MHz, and architecture Diros claims will support 16 MHz. It has 1 megabyte of RAM, a hard disk/floppy disk controller, and a 1.2-megabyte floppy disk drive.

Wintech Data Products Corp.'s \$2,195 Proteus 286 has switchable 6/10-MHz clock speeds. One megabyte of RAM is standard on the

system board, and, in addition to a 1.2-megabyte floppy disk drive, Wintech has a hard disk controller card that drives a  $\frac{5}{8}$ -inch or a  $\frac{3}{4}$ -inch floppy.

**List Price:** Telex 1260 base system unit that has 256K RAM, \$2,485. Telex 1280 with 512K RAM, \$2,990. Telex Computer Products Inc., 6422 E. 41st St., Tulsa, OK 74135; (918) 628-3284.

CIRCLE 441 ON READER SERVICE CARD

**List Price:** Rostech PC 286, with 1Mbyte RAM, 1.2-Mbyte floppy disk drive, \$2,053. Diros Marketing Inc., 7259 NW 12th St., Miami, FL 33126; (800) 553-4767.

CIRCLE 442 ON READER SERVICE CARD

**List Price:** Proteus 286, with 1Mbyte RAM, 1.2-Mbyte floppy disk drive, hard disk/floppy controller card, \$2,195. Wintech Data Products Corp., 377 Rte. 17, Airport 17 Center, Hauppauge Heights, NJ 07064; (201) 288-8629.

CIRCLE 443 ON READER SERVICE CARD

It prints full-page 300- by 300-dpi graphics and emulates the HP Laserjet, IBM PC Graphics Printer, Epson FX-80, and NEC Spinwriter, among others.

**List Price:** Epson GQ-3500, \$2,495. Epson America Inc., 2780 Lomita Blvd., Torrance, CA 90505; (800) 421-5426.

CIRCLE 444 ON READER SERVICE CARD

**List Price:** Citizen Overture 110, \$2,395. Citizen America Corp., 2425 Colorado Ave., #30, Santa Monica, CA 90404; (213) 453-0614.

CIRCLE 445 ON READER SERVICE CARD

**List Price:** Sperry Model 37 Laser Printer, \$3,500. Sperry Corp., Information Systems Group, P.O. Box 500, Blue Bell, PA 19424; (215) 542-4011.

CIRCLE 446 ON READER SERVICE CARD

# BATRAM Creates Nonvolatile Storage with RAM Chips

## TE HANDS ON

A creative use of dynamic RAM chips earns BATRAM lots of points for innovation. It offers high-speed storage but asks a premium price for the novelty.

BY WILLIAM G. WONG

Santa Clara Systems' BATRAM is not a hard disk and not a RAMdisk—it's a little bit of both. A subsystem that uses 256K-bit dynamic RAM chips, a power supply, and a battery for backup, BATRAM emulates a 4- to 20-megabyte hard disk.

Essentially an external RAMdisk, BATRAM is designed for long-term storage, which it provides as long as the plug stays in the wall. BATRAM's rechargeable electro-



*BATRAM announced: A 4-Mbyte board is standard with BATRAM. There are slots for up to four more that can only be bought from Santa Clara Systems.*

lyte-cell battery offers protection against power failures for up to two weeks. Data stored in BATRAM will be lost only if there is an extended power loss or if it is purposely erased. Unlike a hard disk, disk accesses carry virtually no speed penalty.

BATRAM has no moving parts, just flashing lights. Its box is slightly larger than most external hard disks and attaches

to a PC using its own cable and a half-size adapter card. The system comes with its own driver, format, and configuration programs that are similar to the DOS utilities. Once you plug the adapter in and run the setup procedure, you can use it like a hard disk. You can boot off it if you are not using an AT or DOS 3.1 and later.

The minimum BATRAM

configuration is 4 megabytes, and you can add up to four more 4-megabyte RAM cards, for a total of 20 megabytes. Down the road, Santa Clara Systems plans to add an upgrade option to 1-megabit chips, for a total system capacity of 80 Mbytes.

Compared to a hard disk, BATRAM's speed is phenomenal. It runs at roughly half the speed of a conventional RAMdisk because BATRAM moves memory through the adapter card, an inherently slower process than a RAMdisk's memory-to-memory transfer.

A backup power supply can be added for additional security, making it suitable for any application requiring intensive hard disk accesses. BATRAM comes with support for Advanced NetWare/86, but you're on your own with other network servers.

BATRAM is a great product, but the price is high—\$1,895 for the base 4-megabyte unit, and \$1,295 for each additional 4-megabyte board. This makes a 20-megabyte BATRAM about \$7,075, or about 7 to 10 times the cost of even a fast hard disk.

The premium price can be justified only if the added speed is worth it. BATRAM saves you from the threat of a head crash inherent to disk drives, but the possibility of losing power for an extended period means it's not a fail-safe storage option. But, if you need the speed, BATRAM is the ticket. □



### Benchmark Tests: BATRAM vs. IBM PC AT Hard Disk and DOS VDISK

BATRAM, running off an IBM PC AT, proved to be nearly five times slower than a RAMdisk on the same machine, but much faster than the AT's hard disk.

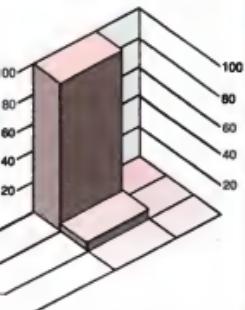
The DOS Disk Access benchmark test measures the time it takes to do a random sector read using DOS. DOS buffers are set at 3 and the interleave factor is left at the drive's default setting. This test adds

DOS's overhead to the BIOS and hardware times. The test program performs the sector read 1,000 times using the DOS data partition. The average result is shown in milliseconds.

#### Performance Times

Product	DOS Disk Access
8-MHz IBM PC AT 30-Mbyte Hard Disk	45.60
BATRAM	2.20
VDISK in Extended RAM	0.50

#### Relative Times (Ratio: PC AT hard disk = 100)



### PC FACT FILE

#### BATRAM

Santa Clara Systems Inc.  
1610 Berryessa Rd.  
San Jose, CA 95133  
(408) 729-6700

List Price: Base 4-Mbyte system, \$1,895; each additional 4 Mbytes, \$1,295.

Requires: DOS 2.0 or later.

In Short: Almost as fast as RAM, but five times as costly as a hard disk, BATRAM should appeal when speed is of the essence and money is no object.

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# Backup Master, Intelligent Backup Save Time and Offer Peace of Mind

## PC HANDS ON

BY WINN L. ROSCH

When word leaked out that the backup utility provided with DOS may produce unrecoverable disks, the software market soon was flooded with alternatives. To stand out from the crowd, each of them offered something extra—speed, features, and convenience—while taking on the tedious but essential chore of backing up data.

Both *Backup Master* and *Intelligent Backup* promise all those advantages in their own unique combinations.

The philosophy underlying Intersecting Concepts' *Backup Master* is that backing up is always a bother, so the less time you have to put up with it, the better you'll like it (and the more likely you'll be to make regular backups). Along the way, it incorporates enough options to make it an excellent backup choice.

Your first encounter with *Backup Master* is with a menu offering several backup choices. Odds are you won't even need to glance at the context-sensitive help system.

As you become more acclimated, a special setup menu lets you configure *Backup Master's* defaults so you don't have to wander through the menu system each time you back up. You can also use a program option that records each keystroke you make and later play back the keystrokes to make backups from DOS or from batch files automatically.

*Backup Master* stores files on normal and high-density floppy disks using either preformatted DOS disks or its own special disk format, which it generates on the fly. The proprietary format squeezes more data on each disk.

You can select any or all files to be included in or excluded from your backup. Furthermore, *Backup Master* gives you unusual control over DOS's file archive bit (which denotes

whether a file has been changed since the last backup). You can use the bit to select files to back up or not, then reset it or leave it alone when you're done.

*Backup Master* also gives you a plethora of options during file restoration, including optional time-sensitive overwriting of existing files. It can completely recreate your original disk directory structure or merely restore a single file. A backup directory, the last file on the last backup disk, helps you find individual files for restoration.

### Uses Two DMA Channels

Unlike DOS's *BACKUP* utility, *Backup Master* takes advantage of the PC's two DMA (direct memory access) channels simultaneously—it's able to read your hard disk and write to a floppy disk at the same time. As a result, *Backup Master* can be two times faster than DOS, which alternates between reading and writing. Keep in mind, though, that some PCs have buggy DMA controller chips, and so both channels can't operate at the same time. *Backup Master* operates more slowly on these machines.

*Intelligent Backup* is an outgrowth of a mainframe disk management program. It was originally known as *DMS/PC* (data management system for personal computers) by its pub-

lisher, Sterling Software.

Essentially, *Intelligent Backup* is a menu-driven DOS interface that offers a built-in backup system as one of its choices. But it works well as a standalone backup system, and like *Backup Master* it makes backups directly from DOS or from a batch-file command.

To reduce your brainload and enhance your peace of mind, *Intelligent Backup* takes a comprehensive approach, providing not only a tool but a system for improving your backup strategy. The program enforces a well-thought-out backup strategy with three selectable levels of backing up: old files, new files, and altered files.

Under the *Intelligent Backup*, new files and altered files are those that changed between today and any user-definable period, say 45 days ago. Altered files have been backed up but changed since the last backup. Old files haven't changed within the defined period.

The three-tier approach makes the backup faster because you can choose the mode that best fits your needs: updated files only; updated files and new files consolidated; or the entire disk.

To help you set up your backup system, Sterling Software includes about 50 labels for your backup disks. The program

## PC FACT FILE

### Backup Master

Intersecting Concepts Inc.  
4573 Heatherlein Ct.  
Moorpark, CA 93021  
(805) 529-5073  
List Price: \$69.95  
Requires: 320K RAM, DOS 2.0 or later.

In Short: A multioptioned backup system that makes clever use of the DOS file archive bit and simultaneous use of two DMA channels for fast hard disk backups onto floppy disks. Not copy protected.

CIRCLE #21 ON READER SERVICE CARD

### Intelligent Backup

Sterling Software Inc.  
202 E. Airport Dr., #280  
San Bernardino, CA 92408  
(714) 889-0226  
List Price: \$149  
Requires: 320K RAM, DOS 2.0 or later.

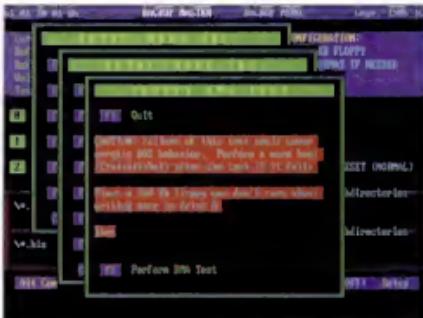
In Short: A combination of DOS front-end and a backup system, it takes an unusual three-tier approach, optimizing the time needed to make regular hard disk backups to various media. Not copy protected.

CIRCLE #22 ON READER SERVICE CARD

keeps a log of your backup activities, and if you mind your backup system properly, you can easily keep track of which file is backed up on which disk. Individual files, blocks of files, and whole disks can be restored. If you want, the system will also automatically remind you to make a backup each day.

*Intelligent Backup* can use any DOS disk-type device for storage—including floppy tape (tape drives that use a disk controller), cartridge hard disks, and Corvus network virtual disks. Media must be formatted before use. To crowd more data on every backup disk, the program uses both data compression and file compaction.

Feature options should determine your choice between the two. *Master Backup* is probably the better selection for straight backing up, but *Intelligent Backup* offers extra power. **PE**



*Backup Master's* setup menu selects the fastest backup speed your machine's DMA channels can handle by running a short test of the disk drive.



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EM RGB Color	\$ 428
AM RGB Color	\$ 486

**ZILLION**

1200 Green composite	\$ 99
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1200 Amber composite	\$ 99
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## DRIVES

**Seagate**

SSP

Internal 20MB Harddisk

with controller

\$379.00

**1-MEGA**

Multi-Magnetic 10MB

Half Height 10.10

Half Height 35MM

3.5" 10MB

3.5" 20MB

3.5" 40MB

3.5" 80MB

3.5" 120MB

3.5" 160MB

3.5" 200MB

3.5" 240MB

3.5" 280MB

3.5" 320MB

3.5" 360MB

3.5" 400MB

3.5" 440MB

3.5" 480MB

3.5" 520MB

3.5" 560MB

3.5" 600MB

3.5" 640MB

3.5" 680MB

3.5" 720MB

3.5" 760MB

3.5" 800MB

3.5" 840MB

3.5" 880MB

3.5" 920MB

3.5" 960MB

3.5" 1000MB

3.5" 1040MB

3.5" 1080MB

3.5" 1120MB

3.5" 1160MB

3.5" 1200MB

**IRWIN MAGNETICS**

10MB Tape Backup Internal

10MB Tape Backup External

10MB Tape External

10MB External

## ■ PC UPDATE ■ PEGGY GAVAN

In an effort to boost sales of its *Javelin* financial-modeling software and apparently to compete with Lotus's *HAL*, a \$150 natural-language interface for 1-2-3, Javelin Software Corp. has reduced *Javelin*'s price, for a limited time, to \$99.95. After 10,000 new copies of the program are sold, *Javelin* will be sold for the original price of \$695. Also, users can now lease *Javelin* through Software Funding International's leasing program. For information on leasing, contact Javelin at (617) 494-1400. For information on purchasing *Javelin* at the promotional price, call (800) JAVELIN.

Tandy Corp. is offering a free CM-5 color monitor, valued at \$299.95, with the purchase of its \$799 1000 EX or \$1,199 700 SX PC-compatible computers. The promotion will end January 1, 1987. Tandy Corp., Fort Worth, Tex.; (817) 390-3921.

**Q&A**, Version 2.0, adds support of local area networks, a file-recovery utility, and the ability to import and export dBASE files from its database. Registered users who purchased an earlier version before September 14 can upgrade for \$49.95; upgrades are free in all users who purchased the program after this date. In addition, users of Software Publishing Corp.'s *PFS:File, Write, or Report* can upgrade to Version 2.0 for \$99 plus a PFS system disk. Symantec Corp., Cupertino, Calif.; (408) 253-9600.

Design Software is bundling its *DSSBackup Plus* and *DSRecover* hard disk utilities into one package, called the Hard Disk Survival Kit. The two products, which would normally be priced at a com-



The \$3,795 LaserPower II laser printer from CMS.

CMS is bundling copies of Digital Research's *GEM Graph* and *GEM Desktop* graphics applications packages with its \$3,795 LaserPower II laser printer. In addition, CMS is including coupons worth \$200 toward the purchase of other *GEM* applications programs. CMS, Costa Mesa, Calif.; (714) 549-9111.

Version 2.3 of the *ArtPak* presentation series incorporates drawing, painting, music, and animation into one program. The new release also features an image-capture capability and a scrolling capability that allows users to connect several screens together to construct larger drawings. Upgrades are \$50 for registered users. Maddison-Crosse Associates, Los Angeles, Calif.; (213) 387-4044.

**MSOFT-SIG**, a special-interest group operated by Microsoft Corp., offers users of Microsoft products an on-line source of news, technical support, and software enhancements. Users can register for MSOFT-SIG on The Source Information Network for \$49.95. Source Telecomputing Corp., McLean, Va.; (800) 336-3366.

**In brief:** Consumers Software is bundling *The Spreadsheet Auditor*, Version 3.0, with 1-2-3. The package is being offered to resellers from Ingram Software for under \$300. Ingram Software, Buffalo, N.Y.; (716) 874-1874... Tecmar has lowered the price of its *Maestro multifunction board* for the IBM PC AT and compatibles from \$529 to \$399, a reduction of 25 percent. Tecmar, Cleveland, Ohio; (216) 349-0600... Westlake Data raised the price of *Path-Minder* from \$39.95 to \$49.95. Westlake Data, Austin, Tex.; (512) 474-4666... Sofbridge Microsystems has added a tax-reform update to its *Financial Planner*, Version 3.0. The upgrade, available free to registered users, incorporates all the effects of the Tax Reform Act of 1986. Sofbridge Microsystems Corp., Cambridge, Mass.; (617) 576-2257... The 1987 version of *Easytax*, used for preparing 1986 tax forms, has enhanced analytical and planning capabilities for the new tax laws and is available on 5 1/4" or 3 1/2" inch disks. Upgrades are \$30. Valley Management Consultants, Huntingdon Valley, Penn.; (215) 947-2707... ChipSoft has introduced the 1987 version of its *TurboTax* software package. The new version has pop-up notepads, a calculator, and on-screen help. Registered users can upgrade to the 1987 federal package for \$32.50. ChipSoft, San Diego, Calif.; (619) 581-2233... Mitchell Management Systems has reduced the price of its *Quick.Plan* decision-support software and its *Time.Plan* time-management program from \$995 to \$495 and from \$129 to \$50, respectively. Mitchell Management Systems, Westborough, Mass.; (617) 366-0800... **CashTrack**, Version 1.1, a home-accounting package, is now hard disk compatible. Upgrades are free to registered users. SubLOGIC Corp., Champaign, Ill.; (217) 359-8482.

General HELP on DSRecover - Press F1 on Items for more help

*Design Software's DSSBackup Plus, a \$79.95 hard disk utility, is now bundled with its \$49.95 DSRecover utility in the Hard Disk Survival Kit, priced at \$99.95.*

bined total of \$129.90, will now sell for \$99.95. Design Software, West Chicago, Ill.; (312) 231-4540.

Mosaic Software has introduced *Twin Classic*, Version 1.4, an upgraded version of its 1-2-3-compatible *Twin* software package. The new version is compatible with 1-2-3, Release 1A, and upgrades are \$9.50 for registered users. Mosaic has also announced *Twin, Release 2*, compatible with 1-2-3, Release 2. Upgrades are \$49. Mosaic Software, Cambridge, Mass.; (617) 491-2434.

Version 2.5 of *ProDesign II* adds on-screen command menus, macro capability, and enhanced autodimensioning, and it removes copy protection. Registered users can upgrade for \$15. American Small Business Computers, Pryor, Okla.; (918) 825-4844.

One Year Anniversary  
over 12,000 networks installed  
**Anniversary Sale!**  
10% discount on all orders thru 12/31/86  
Credit card or C.O.D. only

# EasyLAN—Networking For Less Than \$100 Per PC

STOP buying expensive duplicate PC peripherals. Usually your peripherals just sit idle. If your office owns two or more PCs can you justify costly laser printers for each PC? How often are your printers actually busy? Thirty minutes a day? An hour a day? Even your expensive hard disks are used infrequently.

The obvious solution to avoid expensive duplicate peripherals is a local area network that allows you to share printer and disk drives. But until now LANs have cost in excess of \$1,000 per PC.

## THE EasyLAN™ OFFICE NETWORK

EasyLAN shares printers and disk drives between IBM PCs. EasyLAN can save you \$1,000 or more per PC by eliminating duplicate equipment purchases.

### EasyLAN HIGHLIGHTS

- EasyLAN shares printers, plotters, data, and disk storage
- PC to PC file transfer
- Print spooling
- New PBX support
- Easy to install
- Easy to operate
- Modem support
- Performs in the background

EasyLAN's low price matches the small business user's cost-sensitive budget. It is the office network solution for less than \$100 per PC including cables and software for a 2-PC or 3-PC network.

EasyLAN performs its operations concurrently in the background. EasyLAN communications, file transfers and printer operations all take place while each PC simultaneously performs such normal DOS applications as Lotus 1-2-3™, WordStar™, and dBASE™.

### NEW PBX SUPPORT

New PBX support allows EasyLAN to transfer data files and share peripherals between PCs using PBX circuit switched connections and twisted pair wiring. EasyLAN has already been installed on a number of different PBX systems and has been certified by Northern Telecom on the Meridian SL 1.

EasyLAN's performance meets your small office or department requirements to move word processing documents and spreadsheets between PCs. For example, EasyLAN can transfer a 10-page document between PCs as a background operation, in less than one minute.

EasyLAN loads automatically at boot time. It manages the PC's serial and parallel ports for communications and printing.

**"The value is high. ☑ ☑ ☑ ☑ ☑"**  
—InfoWorld Report Card

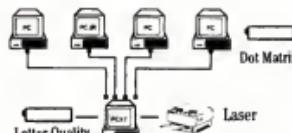
Printer sharing operates transparently with existing programs. Print files are automatically spooled to disk and scheduled for printing. Multiple printers per PC may be designated for specific office tasks.

**"I bought access to a laser jet printer for \$80."**

—CONOCO Oil User

Disk sharing uses EasyLAN's EZCOPY command to move files to and from PCs. ASCII or binary files can be transferred in the foreground, or in the background while other DOS programs run.

All communication operations are protected by a unique password assigned to each PC so security is maintained.



**EasyLAN Office Network**

### EasyLAN SPECIFICATIONS

Each PC in the network requires an individual licensed copy of the EasyLAN program and takes 20K of memory on each satellite PC, a serial port, and DOS 2.0 or above. EasyLAN disks are not copy protected. EasyLAN runs on all IBM PC models and compatibles. The HUB PC requires a serial port for each satellite PC. The COM2 and COM6 boards are serial port expansion boards which permit you to add serial ports to the HUB PC.

**ORDER TODAY 1-800/835-1515** in CA 406/738-8377

### EasyLAN Order Form

To Order by Phone—Call 800/835-1515  
In CA 406/738-8377

For Configuration Assistance & Technical Questions  
Call 406/738-8377

**Place your Order Immediately**  
**Dealer Inquiries**  
**Invited**

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Address \_\_\_\_\_

City \_\_\_\_\_

State \_\_\_\_\_ Zip \_\_\_\_\_

Telephone (\_\_\_\_\_) \_\_\_\_\_

Payment: Visa, MasterCard, Check, COD, Bank Draft

Name on Credit Card \_\_\_\_\_

Cr. Card No. \_\_\_\_\_ Exp Date \_\_\_\_\_

Server Technology, Inc., 1095 East Duane Ave. #103  
Sunnyvale, CA 94086 Tel: 510/606/0481

### EASY TO INSTALL

EasyLAN can be installed in less time than it takes to enjoy your coffee break. Just plug the EasyLAN cables into existing serial ports. The EasyLAN Network Configuration Program provides a menu driven installation program that will guide you step-by-step through the software installation process.

### EASY TO ORDER

EasyLAN is a proven product with over 12,000 installations. To order just call toll free 800/835-1515. Start with a two PC network and expand as your needs demand.

**"If it does all you need why spend more?  
It is the ultimate example of practicality  
in a local area network."**

—PC Magazine

### PRODUCT SUPPORT

We take pride in our quality product support. EasyLAN support is provided over the telephone by the same people who installed over 12,000 networks last year.

**"I look for products that make my job easier and save my company money.  
EasyLAN does both."**

—Mini Micro Magazine

**EasyLAN**

**TOTAL ORDER \$ \_\_\_\_\_**

# TeleVision Creates, Sends Graphics via E-Mail Systems

## PC HANDS ON

BY BARBARA KRASNOFF

I tend to be suspicious of vendors who spend an inordinate amount of care packaging their software based on my belief that the prettier the package, the less useful the product. However, in spite of its natty gray carrying case and cuties name, *TeleVision* is an impressive program.

*TeleVision* lets you send graphics images over e-mail networks that usually accept only ASCII-type files (MCI Mail, DialCom, Western Union's EasyLink, and so on) by converting image files into textual coding that can be read by a PC running *TeleVision* at the other end of the line. It's compatible with CompuServe's RLE graphics, so you can download anything available, from weather maps to the FBI's ten-most-wanted list.

The easiest way to accomplish this is to use *TeleVision*'s own mouse-driven graphics program. While it does not have the capabilities of more-sophisticated (and -expensive) graphics systems, *TeleVision* can produce quite adequate business graphics and has a nicely round-

ed image library. The Savefile utility uses the Shift-PrintScreen keys to take "snapshot" of medium-resolution, four-color screen images for enhancement. Among *TeleVision*'s options are sizing, rotation, and shading, but it's limited to the CGA's 320x200 by 200-pixel four-color resolution.

### Binary to ASCII and Back

By using a series of pull-down menus, you can transmit an image through an e-mail system with little need for either the

manual or the keyboard. The recipient (who also must have a copy of the program) of the graphic will be automatically signaled by *TeleVision* when it catches an image coming in, and the graphic will be saved into the program's library. *TeleVision* supports a wide range of printers, the HP 7470 and Houston Instrument DMP-29 plotters, and the Polaroid Pallette.

The program can encode virtually any binary file—1-2-3 .WKS spreadsheets, .DBF files, .EXE programs—for de-



*TeleVision's lack of EGA support means presentations will suffer from jaggies, although the program does have enough image manipulation techniques to provide you with fairly sophisticated graphics.*

## PC FACT FILE

### *TeleVision*, Version 1.0

LCS/Telegraphics  
261 Vassar St.  
Cambridge, MA 02139  
(617) 547-4738

**List Price:** \$99, plus \$5 shipping and handling.

**Requires:** 256K RAM; IBM CGA or compatible graphics board; Hayes SmartModem, AT&T 4000, or compatible modem; any Microsoft-compatible mouse; Kurta tablet, or Penmouse; DOS 2.0 or later.

**In Short:** *TeleVision* is an extremely useful telecommunications program that enables companies to send CGA business images and programs through their text-only e-mail systems. Not copy protected.

CIRCLE 427 ON READER SERVICE CARD

livery through any e-mail system that accepts uppercase text files. The files must first be converted into *TeleVision's* proprietary format and will look like gibberish unless translated by *TeleVision*.

By combining presentation graphics and telecommunications at a reasonable price, *TeleVision* has hit upon a potent combination. The addition of EGA compatibility could turn it into a real winner. ☐

# Ausdata Entry: A Fast but Inflexible Data Entry System

## PC HANDS ON

BY HOWARD MARKS

*Ausdata Entry*'s ad calls it "the fastest, most powerful data entry software for your PC."

The ads don't mention easy or flexible. And that's good because *Ausdata Entry* is the most cantankerous data-handling software I've seen on a PC.

The basic concept of data entry software is that a full data-

base management package may be too expensive or slow for simple data entry. A data entry package should let you create a screen with data validation features to improve input accuracy. It should also be fast enough so that even the best typists won't be able to out-type it.

While *Ausdata Entry* meets these requirements, it lacks features to make the job simple enough for a nonprogrammer. Defining a screen in *Ausdata*

*Entry* means writing a program in its own language, in which every command is just one letter. Most database products have a screen editor that lets you define the entry screen and format by painting it on the screen.

*Ausdata Entry* does not allow for field verification from another file—a key flaw.

*Ausdata Entry* is a difficult to set up but fast system for entering data in batches to a single file. Most applications would be

## PC FACT FILE

*Ausdata Entry*  
Ausdata/USA Ltd.  
2326 Walsh Ave.  
Santa Clara, CA 95051  
(800) 255-3589  
(408) 748-9066

**List Price:** \$695

**Requires:** 256K RAM, DOS 2.0 or later.

**In Short:** A limited and hard-to-use data entry package. Not copy protected.

CIRCLE 428 ON READER SERVICE CARD

better served by a file-management system. ☐

# No other video adapter revs up as much software, drives as many monitors, or fine tunes as many graphics.

STB Systems has just combined the technology of the industry's five most popular video display adapters: the IBM Color Graphics and Monochrome/Printer Adapters, the Hercules Graphics Card™, the Tseng UltraPAK-S™, and the STB Chauffeur™.

With the new Chauffeur HT™, the world's best graphics capabilities are at your service.

## Roll through any software.

The Chauffeur HT lets you use any and all standard CGA or MGA compatible software. No preboot software or special drivers are needed.

## Drive a fleet of monitors.

With The Chauffeur HT, you can emulate any color graphics software, producing 16 shades of gray on any IBM compatible monochrome monitor. CGA 200 line graphics modes are expanded to a full-screen format. Text is displayed as high resolution 8 X 14 characters.

The Chauffeur HT displays Hercules compatible software at 720 X 348; it provides a 1024 X 348 display mode for the CAD/CAM market, and a crisp 132 column display for spreadsheet and terminal emulation users.

Using any standard RGB color monitor or Enhanced Graphics display, you can produce monochrome quality text while maintaining high resolution, 16 color graphics. Even Hercules compatible software can be produced on enhanced monitors.

## Enjoy the extras.

In addition to giving you greater graphics capabilities on a wider range of monitor types, with a wider selection of software,

The Chauffeur HT gives you a standard parallel printer port, an optional clock/calendar, a light pen interface support, PC Accelerator software, and full compatibility with the IBM PC, XT and AT.

	CGA	ECC	Hercules	TS
Enhanced Graphics Display	Yes			
RGB Color Display	Yes		Yes	
Monochrome Displays	Yes	Yes	Yes	Yes
2D Video Display				
<b>Software Capabilities</b>				
IBM Monochrome Display	Yes	Yes	Yes	Yes
IBM CGA	Yes	Yes	Yes	
Monochrome Monochrome Graphics	Yes		Yes	Yes
132 Column Displays	Yes	Yes	Yes	Yes
<b>OPTIONAL EQUIPMENT</b>				
Parallel Printer Port	Yes	Yes	Yes	Yes
Stand alone CGA, Monochrome, Hercules, TS (no drivers required)	Yes			
Clock/Calendar	Optional	Optional		Yes

## Honk for more information.

For detailed information on The Chauffeur HT, call or write STB Systems, Inc., 601 North Glenville, Richardson, Texas, 75081. (214) 234-8750.

It's the only way to travel through tomorrow's graphics.



NOW  
SHIPPING

# Meet The Chauffeur HT

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601 N. Glenville, Suite 125 • Richardson, Texas 75081 • (214) 234-8750 • TELEX 6506714234STB • FACSIMILE (214) 234-1306

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# IBM presents four to come to the show



There are countless reasons why over three million people have made IBM® the first choice in business computing.

But here are four of the best: the computers that make up the IBM family of business PCs.

Together, they offer a full range of choices in power and price. And now, we're celebrating their fifth anniversary.

## The IBM Personal Computer. A classic example.

It's no wonder business has grown attached to the IBM PC—a perfect balance of power and affordability.

As a first computer, it's a natural choice for helping with basic business tasks, from letters to ledgers.

## IBM Personal Computer XT.™ The bigger you get, the better it gets.

With eight expansion slots, the PC XT™ is literally built for growth. So adding new features is as easy as plugging them in.

It's available with a hard file that stores 10,000 double-spaced pages of information.

And the new PC XT Model 286 gives you even more—extra speed to get through your work faster.

## IBM Personal Computer AT.\* High performance reaches new heights.

The AT stands for Advanced Technology. Which means it's extraordinarily fast. And can store mountains of information—30,000 double-spaced pages' worth, with a pair of 30-megabyte hard files.



# ur different ways ame conclusion.

No question, the Personal Computer AT is *the* computer for people who work with lots of information and need to get to it fast.

## The IBM PC Convertible. One computer for people who really need two.

Here's a powerful computer you can use as a portable or a desktop. It works with both a flip-up screen and an optional desktop monitor.

The PC Convertible weighs just over 12 pounds, but it's a full-fledged member of the IBM PC family. And there's really nothing lightweight about that.

**Meet the extended family.**  
IBM makes even more powerful PCs as well.

There's the super-fast IBM RT PC, for technical professional uses. The IBM 3270 PC, for access to IBM mainframe computers.

And the IBM System/36 PC. It can work alone or share its resources with a group of PCs (or other System/36 computers).

## Draw your own conclusion.

IBM offers quite a choice in PCs. As well as a choice of affordable ways to get one: the IBM Credit Cards for individuals and companies, and the IBM Commercial Lease Agreement.

For further details, visit an Authorized IBM PC Dealer, or call your IBM marketing representative.

For a store near you, call 1-800-447-4700. (In Alaska, 1-800-447-0890; in Canada, 1-800-465-6600; for a Value Added Dealer, 1-800-426-8277.) **IBM**

CIRCLE 270 ON READER SERVICE CARD

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# SYNC TWICE.

## MULTISYNC™ SETS ANOTHER INDUSTRY STANDARD WITH A GRAPHICS BOARD THAT OFFERS PGA RESOLUTION AT AN EGA PRICE.

Another standard from MultiSync™. First, the MultiSync monitor, the original color monitor compatible with CGA, EGA, and PGA graphics adapters.

Now, the new MultiSync GB-1 graphics board.

With a MultiSync monitor, the GB-1 actually takes EGA all the way to PGA resolution - 640 X 480!

Compatibility is no problem. The GB-1 syncs with EGA and CGA color text and graphics, and with MDA and Hercules™ monochrome.



Built-in screen drivers ready for 1-2-3™, Windows™, AUTOCAD™, Dr. Halo II™.

So you're ready for the top spreadsheet, window and CAD/CAM programs in ultra high resolution, without investing in more boards. Even a parallel printer port is included.

### Free Dr. Halo II software

This powerful program provides dramatic color for business graphics. With smoother scrolling, Hardware Zoom, Hardware Viewport, and pixel panning.

### Desktop publishing comes true

When you create graphics for business presentations, your free Dr. Halo II software works like a paint brush. Just pick your palette, and work in the clearest colors. It accommodates a wide assortment of type fonts, too.

**CaC** Computers and Communications



## MULTISYNC™

### 132 column spreadsheets

You can display up to 132 columns by 44 lines. With text, your screen will show nearly a full page.

\$50 rebate on the Multisync of your choice

And just for good measure, you can get cash back on either the MultiSync graphics board or the 14 inch MultiSync color monitor to go with it, America's No. 1 seller.

Check with your MultiSync dealer before you buy a graphics board, update your system or invest in a new one. He has the graphics board, the monitor and the rebate that will open your eyes. Your computer's, too.

For product information and sales assistance, call 1-800-447-4700.

For technical assistance and information, call 1-800-NEC-SOFT.

NEC Home Electronics (U.S.A.) Inc.  
Computer Products Division  
1255 Michael Drive  
Wood Dale, Illinois 60191.

# NEC

MultiSync is a registered trademark of NEC Home Electronics (U.S.A.) Inc. 1-2-3 is a registered trademark of Lotus Development Corp. Windows is a registered trademark of Microsoft Corporation. AUTOCAD is a registered trademark of Autodesk, Inc. Hercules is a registered trademark of Hercules Computer Technologies. Dr. Halo II is a registered trademark of Media Cybernetics, Inc.

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## QUICK LOOKS

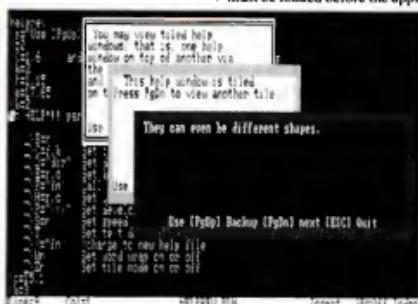
# HELP!!! Lends a Hand To Program Developers

**PC HANDS ON**

BY ELLEN R. SKLAYER

Help screens present a golden opportunity for an applications developer to shine. Goldata Computer Service's *HELP!!!* applies the polish by letting you customize slick help windows for any program.

The developer uses *HELP!!!*'s text editor and simple parameter statements to form help windows. Context sensitivity is achieved by using words (up to eight letters) that appear in the application as the parameter filenames; when you hit the "hot key," *"HELP!!!"* pops up the screen whose file-



When *HELP!!!* runs simultaneously with an application, it will file context-sensitive windows if a *HELP!!!* filename appears near the cursor.

## 101 Macros: A 1-2-3-Taming Arsenal

**PC HANDS ON**

BY IRIS KNITTEL

Want to become a macro master instantly? Only practice can do that, but *101 Macros for Lotus 1-2-3* can let you in on some of the secrets. This easy-to-use macro library will have a novice running powerful prewritten macros in moments.

Some of the 101 are simple timesavers, like the ones that sum, average, or count instant-

ly. Others are convenience macros, like the Go-Return macro that lets you wander around your spreadsheet and then return to your original location.

There are macros that tame the tedium of data entry: like the Address Database macro or the Copy macro that leaves the cursor on the Copy To cell. There's a macro for hiding invisible messages in your worksheet; another that helps you calculate your print range; there are also a number of helpful print macros,

name is closest to the cursor.

The developer links help screens to a program by creating a run-time *HELP!!!* file that can be made memory resident and must be loaded before the applica-

cation runs. Goldata's license allows the developer to create only one run-time file; additional run times or an unlimited license are sold separately.

Although *HELP!!!* is not a RAM hog, the manual neglects to mention incompatibilities, notably with *SuperKey*. *HELP!!!*'s problems are minor, especially when compared to its potential for timesaving, program customization, and impressive context-sensitive help windows.

**List Price:** *HELP!!!*, \$149.95; additional run times, \$29.95 each; unlimited license, \$995. **Requires:** 34K RAM beyond application overhead, DOS 2.0 or later. **Goldata Computer Services Inc.**, 2 Bryn Mawr Ave., Bryn Mawr, PA 19010; (215) 525-1036.

**CIRCLE 428 ON READER SERVICE CARD**

national promises to fix in its next edition).

*101 Macros* works with all versions of 1-2-3 (Release 1A, 2.0, or 2.01) and there's also a *101 Macros for Symphony*. *101 Macros for Lotus 1-2-3* gives you the opportunity to pick the brains of a meticulous macro writer for just \$49.95.

**List Price:** *101 Macros for Lotus 1-2-3*, \$49.95. **Requires:** DOS 2.0 or later. *1-2-3*, Macropac International, 1985 Stevens Creek Blvd., Cupertino, CA 95014; (800) 227-2400, ext. 945.

**CIRCLE 429 ON READER SERVICE CARD**

## ConvertR: Measure for Measure

**PC HANDS ON**

BY PAUL M. STAFFORD

Quick now, how many liters to a gallon? How many BTUs in a kilowatt-hour? If you don't know off the top of your head, the next best thing to a massive cram session may be *ConvertR*, a memory-resident conversion calculator by Gordon S. Buck.

This program is so simple

and useful I feel stupid for not having invented it myself. Whenever you need to convert a measurement to a different system, Alt-F9 pops *ConvertR* onto the screen, showing ten lines worth of the 200 conversion factors that are supported. For your \$50, you also get a stand-alone (non-memory-resident) version of the program.

A typical example looks like:

Deg F. Each number is called a "cell." To convert numbers in quantities other than the defaults, you move the cursor to the quantity you know, type in the value you need converted, and hit Enter.

The conversion factors are saved in an ASCII file, and the format is simple and well documented, so if a conversion you need is not supported, you can add your own.

*ConvertR*'s main fault is that it does not let you install it on a different "hot key"—if your favorite application already uses Alt-F9, you may be out of luck. If you have the wherewithal to patch the hot-key sequence with DEBUG, even this minor problem can be fixed.

**List Price:** *ConvertR*, \$50. **Requires:** 32K free RAM, DOS 2.1 or later. **Gordon S. Buck**, 5801 Parkhaven Dr., Baton Rouge, LA 70816; (504) 293-6581.

**CIRCLE 424 ON READER SERVICE CARD**

# FoxBASE wins the dBASE race!

## 6.43 times faster than dBASE III PLUS

New FoxBASE+ sweeps the field: runs 2.26 times faster than Clipper, 6.69 times faster than dBCOMPILER, and 10.86 times faster than dBMAN! And FoxBASE compiles programs up to 60 times faster than other compilers.

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## ■ FROM THE EDITOR'S SCREEN ■ BILL MACHRONE

# THE PRICE IS GOING UP

*Despite our fondest wishes, we may have seen the last of the great, cheap programs. The next generation of software prices will, out of necessity, be higher.*

The bad news is that it costs more than ever to develop a significant new applications program. The good news is that they're better than ever and getting better all the time. The best news is that future versions of DOS will allow programmers to give us applications that perform beyond our wildest expectations. Trouble is, Corporate America is not planning for the next revolution.

I cohost a quarterly teleconference with Dean Meyer, the Ridgefield, Connecticut-based guru of teleconferencing and office automation. Our guests are the industry leaders who make things happen in this market. Our sponsors are some of the leading companies in the United States and Canada: industrials, oil companies, financial institutions, and insurance companies. Infocenter managers, heads of MIS, and sophisticated end users are the audience, all linked by audio conferencing hardware.

**BUYING PLANS FOR 1987** In our most recent Teleforum, Microsoft vice president Steve Ballmer was our guest speaker, and his topic was advanced operating systems. As is our custom in Teleforums, we started with a few survey questions: Of the personal computers to be purchased during 1987, what percentage would be 8088-based, 80286-based, or others? Among those others, we included Macintosh and 80386 machines. We also asked about interest in UNIX, *Microsoft Windows*, and the percentage of machines that were connected in local area networks or to mainframes.

Some of the results were hardly surpris-

ing: Companies were waiting for more applications before they made a commitment to *Windows*. Only one company in ten had any measurable commitment to UNIX. Macintosh was typically about 5 percent of each company's buying plans, directed into specialized areas. And a few power users were getting 80386 machines.

But what amazed both Ballmer and me was the ongoing commitment to 8088 technology. Only two companies had made a strong commitment to 80286 technology, and most were committing the majority of their buying dollars to 8088s. The typical justification for this course of action was that with the standard PC there's no need for more speed: users have computing power left over.

They also have no future.

Let's face it: 1987 is the last year for new 8088 programming. Once protected-mode DOS is introduced, software companies will be faced with the choice of pro-



gramming for the past or programming for the future. Sure, there are 6 million PCs out there, and nearly a million ATs, but we're looking at dynamic machines versus static machines.

In our impromptu survey of Teleforum participants, there was a high correlation between 8088-focused buying plans and the percentage of machines hooked to a mainframe. Translation: these machines are substituting for 3270s at least part of the time. They're terminals, not computers. That's not a bad thing; the dumbest PC is a lot brighter than the smartest 3270. It sounds like a good hedge against obsolescence, and you certainly don't need the speed of an 80286 to do terminal emulation.

But you do need an 80286 to run protected mode DOS, and it's a sure bet that PM-DOS won't run on today's 286-based accelerator cards. And an 80386 accelerator card for your PC-XT makes no sense at all. So the 8088 is a dead end. In fact, the rate of 8088 sales has decreased, while the rate of 80286 sales continues to increase.

**STATIC OR DYNAMIC?** So the existing crop of 8088s will become static in their capabilities. In a sense, they'll become like the old CP/M machines: competent, but no longer state of the art.

Protected-mode DOS, meanwhile, will free software designers from two important restrictions: memory limitations and tricky ways to do more than one thing at a time. Almost every significant program can benefit from multitasking. For spreadsheets, it means never having to suspend



## ■ FROM THE EDITOR'S SCREEN

recalculation. Recalc becomes a separate process, one that knows how to manage the visible portion of the screen first. Database programs benefit from multitasking by separating the mundane chores, such as

reorganizing indexes, from the more immediate task of servicing the user. Even word processing programs can benefit by separating spelling checking and thesaurus lookup into separate programs, instead of

cluttering up the main word processing program with less-used features. The subordinate tasks remain in memory—running, but not interfering with, the basic task of editing and text display.

Today's software designers resort to some horrendous tricks to get multiple things going in the machine. The tales of terminate-and-stay-resident (TSR) programs and the conflicts they generate are a modern legend. I know of one word processing program that takes over the machine and reloads DOS as a subtask in order to give users functionality. Most new communications software contains a multitasking module just to handle the load. Protected-mode DOS provides an environment in which multiple things can work and not step all over one another.

But here's the rub: everything has to be rewritten. And the rewrite won't be easy. Programmers will have to know a lot more and take many fewer liberties with the hardware if they are to survive in the next DOS world. The day of the 14-year-old whiz programmer is about over. Everyone is going to have to be more professional and better trained to make a go of it. Coding will take longer.

And that's why the price is going up. It's a tremendously risky business to bring new software to market. I know of one new program for which a top designer charged a top company a cool \$2 million. How many software publishers can afford a tab like that? Distributors are less than courageous when it comes to stocking new programs, and dealers are even more cautious. After all, it's their money. It costs a bundle to do the marketing to make a new program successful, too. Even good programs can wither on the vine. Witness *Javelin*, an advanced program for time-series analysis and consolidation, which was misrepresented as a 1-2-3 replacement when no one was looking for one. Several new products are gaining notoriety for being three-dimensional spreadsheets, when *Javelin* has always been *n*-dimensional. A secret too well kept, if you ask me.

The next generation of software will have to battle its way into our hearts and minds against some firmly entrenched and excellent existing products. It'll be a long, slow, uphill battle. It won't be easy, and it won't be cheap.

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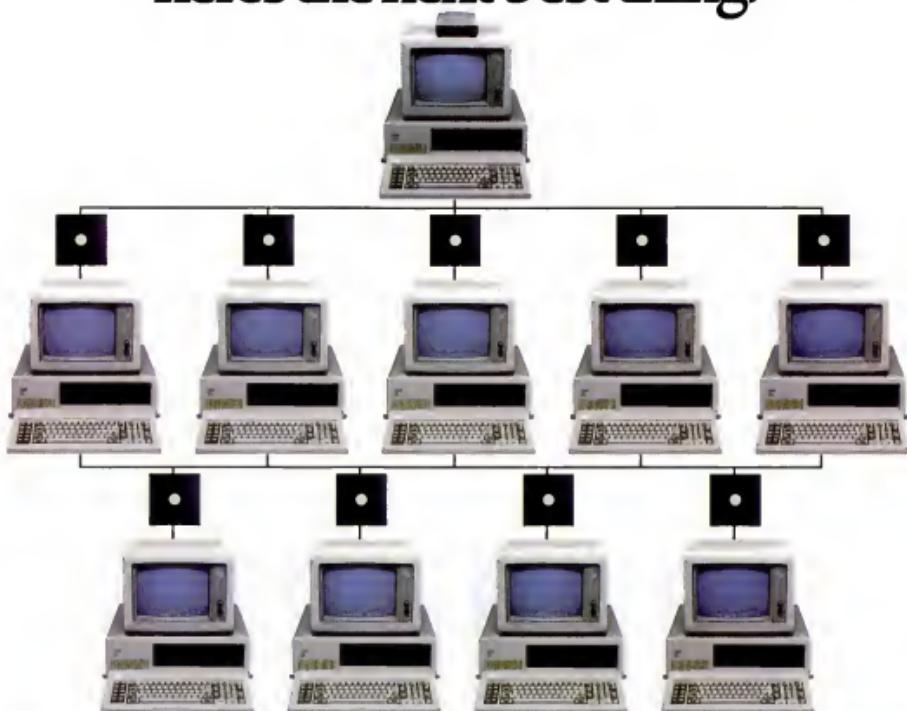
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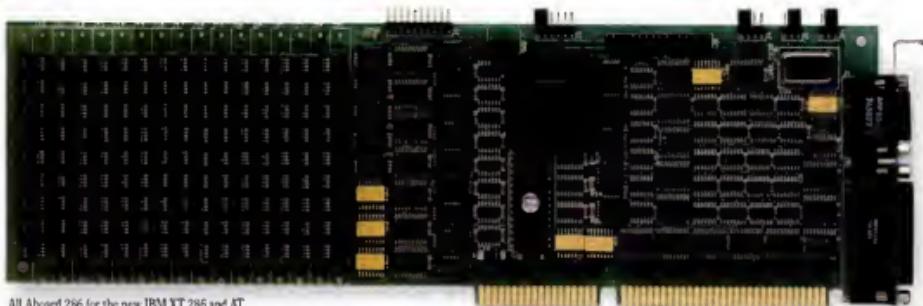
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VISA

■ JOHN C. DVORAK

# REPLAY OFFICIATING NEEDED FOR AT&T



*AT&T has thrown its considerable corporate weight around the microcomputer market for a while now, with few positive results. At year's end, let's review AT&T's ongoing flop.*

Nineteen eighty-six wasn't the best year for the microcomputer scene. Sure, sure, there were a lot of nifty new products. The 80386 hit the scene; fast EGA cards were there, too. But these and other power products couldn't turn around the peculiar sense of despair that haunted the business all year. AT&T and its last-minute rethinking of its computer business got the vote for my favorite event. It earmarked 1986 as the year of the big loser and the year of the big winner. (Microsoft's and Borland's public offerings were the big winners.)

We knew this would happen. The year began symbolically with the Super Bowl. It was the Chicago Bears, a symbol of the low-tech Midwest, against the Boston Patriots, a symbol of the hi-tech East Coast. Chicago won handily, 256-2. The Pats could only score a safety when, as a joke, the Bear center tried to run out of the stadium with a souvenir ball.

The farm boys are still laughing at the technologists, but the technologists got the last laugh when they made the NFL put in a long-overdue instant replay to help the officiating. AT&T could use replay officiating, too. It would give everyone a closer look at some of its decisions. I'm sure a lot could be learned from some videos of early AT&T marketing meetings.

**JUNIOR JIVE** To me, everything AT&T did smacked of PCjr schemes. There was a sense of arrogance about the company and its plans. To the insiders, the big mystery was why AT&T couldn't do diddly with its heavily promoted BellMac

32-bit microprocessor. All the while, research companies told us how AT&T would give IBM a run for its money. Even IBM was leery of the kind of bucks AT&T could put behind its efforts.

But with little regard for the idiosyncrasies of this market, AT&T fell all over itself and busted up the place like a drunk at a bone china exhibit. When it listened to consultants, it listened to the wrong ones and brought out the AT&T 7300—a cumbersome UNIX box too big to fit on a desktop although it was supposed to be a desktop machine. What a dog that was! Then it brought out still more UNIX boxes and admits that it's selling 10 percent of what some marketing person said should sell.

I know a poor small-business man who got suckered into buying one of these white elephants. Some local computer consultant thought it would be the best machine because you could hook a couple of terminals to it. "What about software?"



you ask. Software? That's not the consultant's problem.

**RETHINK TANK** There are a few lessons we can learn by looking back on the AT&T saga. AT&T didn't know what it was doing from day one and didn't bother to ask for help. It lost money, you say? \$300 million? \$600 million? \$900 million?! You have to ask yourself, why wasn't someone fired? How can a company in Houston, namely Compaq, make a buck while deep-pocketed AT&T loses money by the bushel? Tell me about it. Explain it. Instead of doing what a responsible company would do—fix the problem—it talks about "rethinking" its strategy. This means it's ready to bail out and leave the users stranded.

I'm angered by all this only because when the AT&T fantastic voyage began, I saw many dubious maneuvers and missed opportunities, and said so in print. I criticized the old fogies who ran the company, describing them as unprepared to work in a nonmonopolistic system (they still make money in their traditional business). Bureaucrats they were. For these complaints I was condemned by more than a few idealists who were convinced that AT&T would take over the world with its machines. They deserve a Bronx cheer.

One last point I've often made is that once you deal with AT&T personnel, you quickly discover that there is a lot of talent among the cadre of low- and middle-management types. Too bad there are too many entrenched and conservative old bureaucrats who won't move over.

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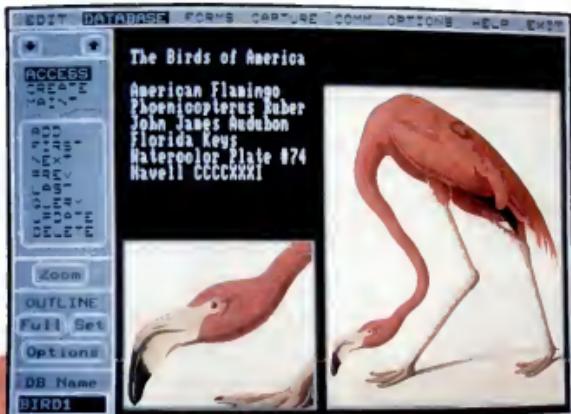
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■ JOHN C. DVORAK

# INSIDE TRACK

*Intrigue, drama, and bitter disputes characterize end-of-the-year shenanigans.*

In a bold move, Microsoft has secretly attempted to buy out still another software firm that makes operating systems software. The gutsy maneuver was precipitated by an apparent feud between Microsoft and the European electronics giant, Phillips.

"There is a strained relationship between those two companies ever since Phillips pulled a fast one and embarrassed Microsoft at the Microsoft CD-ROM conference earlier in the year," a source told me. It's there that Phillips, unbeknownst to Microsoft, announced a joint venture with Sony for a new CD-based data storage device—the CDI (Compact Disk Interactive).

The surprise announcement subordinated Microsoft's attempt to make the CD-ROM a viable standard, and it put the compact disk market in turmoil.

Within a few months, Microsoft attempted to find a way to buy out **Microware**. Microware is the Des Moines, Iowa-based operating systems developer of the OS-9 operating system developed for the Motorola microprocessor family. Phillips chose OS-9 over 60 other systems it evaluated to use as the operating system for its 68070-based CDI engine.

If the buyout were accomplished, it's possible that Microsoft might have attempted to queer the OS-9 deal with Phillips as a last-ditch effort to stall CDI in hopes of reestablishing its flagging CD-ROM standard.

Word on the street had it that Microsoft badly wanted Microware and offered millions to get it.

When asked point-blank about the rumor, Microware president Ken Kaplan refused to confirm or deny it, saying instead, "Let me just tell you that being a

privately held company has its advantages when you want to avoid being bought out."

**OS-9 is a super operating system.** It was originally written for the 6809 microprocessor by Kaplan, Larry Crain, and Robert Doggett. It is genuinely multitasking, ROMable, modular, and UNIX compatible. There are no plans to port it to the Intel micro family. Kaplan feels the chore wouldn't be trivial and says the company would perhaps license someone else to make the port "if they were big and named IBM."

Whatever the case, developers wishing to work with the CDI intelligent peripheral will have to learn OS-9 and develop ways to make MS-DOS and UNIX talk to it.

Meanwhile, what about a new operating system for the IBM PC family? The most interesting development in operating systems technology is the introduction of VM-386 from Softguard (of all people).

VM (which means virtual machine) is the "in" operating system among the users of big IBM machines. Suffice it to say that it creates the kind of multitasking environment we all want. VM, running in protected mode, can coordinate any number of tasks that variously "think" they are running under MS-DOS, UNIX, Theos, or VM itself. Because the nature of the 80386 doesn't allow for multiple protected-mode tasks, VM will let the tasks "think" they are running in unprotected mode with EMS so they won't be limited to 640K.

It's worth noting with this scenario that EMS will not go away, as I and others suspected it might. Its future is assured (actually strengthened) by the 80386's architectural quirks. This is

something that just dawned on me.

Meanwhile, Softguard, which has been financing its OS effort by selling complex copy-protection schemes, has a public relations problem on its hands. A few user groups have passed around a terrible Trojan horse program called SUG.AR/CUG.COM. Look out for it.

The program claims to unprotect Softguard programs. Instead, it trashes the hard disk and puts a threatening note on the screen advising the user to contact the Softguard attorney. Softguard denies any knowledge of the origin of this product. There are liability issues facing a company that would release such a program. Not a good idea.

Whatever the case, let's hope the company focuses its effort on operating systems, and not protection systems and the bad karma they create.

**Hot-rodding-the-PC Dept.:** As people get their processor speed up, the first thing they discover is a noticeable irritation experienced by slow disk accesses. One way to correct this is to use a disk cache. A cache provides RAM speed to many repetitive disk accesses. It's kind of like an intelligent RAMdisk that never contains the same files and programs.

The most fantastic PC cache I've discovered is *Super PC-Kwik*. I tested it against *Lightning*. While *Lightning* edged it out slightly in some disk-read functions, only *Super PC-Kwik* drastically sped up disk writes. On a floppy disk, the increases were incredible. We're talking about a 500 percent and more increase in floppy disk timings. Fast hard disks typically have a 40 to 50 percent speed increase. Nothing to sneeze at. Sort timings can be easily cut in half. *Super PC-Kwik* will also work in both extended and expanded AT memory. Highly recommended for performance-minded users. List price: \$79.95. Contact Multisoft Corp., 18220 SW Monte Verdi Blvd., Beaverton, OR 97007. Phone the company at (503) 642-7108. □

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■ PETER NORTON

# PICKS AND PANS—MINUS PASSION

*In a year in which few products stand out as the best or worst, people are waiting to see whether IBM will take the PC on the road to disaster.*

An interesting observation about this year is that there are few outstanding candidates for "The Best and Worst of 1986."

For me, the best and worst hardware are both in the same category—laptops: the Best Hardware of 1986 is the Toshiba T3100 (or, if you'll permit me a pair of co-winners, the plug-in AT-speed T3100 together with the battery-powered PC-speed T1100 Plus).

There's no true Worst Hardware of 1986 winner, but filling in, in my mind, is the Most Disappointing: IBM's PC Convertible.

Beyond the best and worst, a Special Achievement nod has to go to the hot new Compaq Deskpro 386 as the Most Significant hardware of the year. Not for what it really is, but for what it points to in the future of the PC family.

**SOFTWARE SILENCE** Software is another matter. I haven't seen anything I really think of as outstandingly good or bad this year. It's been a rather quiet year in software, which I think is just fine. It takes an enormous amount of effort to adjust to new software and to make it a productive part of our work regime. The PC user community has suffered from software indigestion over the last 2 years, and I believe that the relative quiet on this year's software front is a symptom of that tummy-ache. We didn't need hot new software; we needed to settle back and benefit from what we already have.

The closest thing to an exception are the exciting new programming tools that Mi-

crosoft is putting out: QuickBASIC 2.0, CodeView, and more. Microsoft is in the midst of changing the programming language game from its crude batch-oriented past into a future of hot programming environments. That's taking what was really exciting in Borland's Turbo Pascal and pushing it a lot further.

**BAD NEWS** The most important development of the year, though, is not a product but what I call the "'86 Disaster"—the mess that IBM is making of the PC family. It's repeating the most catastrophic mistake it ever made. Twice in its history, IBM has made really smart moves that amounted to tremendous gifts to the computing community and became a tremendous way for it to make money. The first was its 360 series of mainframes; the second, of course, was the PC. Each time, however, IBM destroyed its stroke of genius by making some really dumb move. If



we want to understand what's happening with the PC family, we ought to take a look at what went wrong the last time.

Twice, IBM's gift to the computing world has been to bring order and unity to a destructively confused variety. Twenty years ago there were too many kinds of computers—including incompatible models with the IBM brand name on them. IBM solved that problem by introducing the 360 series, which could do both commercial and scientific computing in one unified architecture. Although IBM's competition wouldn't agree, this was a great gift to the computing community because it meant that about 70 percent of the mainframes around used a single, common architecture. Less competition and variety in the mainframe hardware led to more competition and variety in everything else: software, disk drives, and so forth.

A similar thing happened in personal computers. Before the IBM PC, 5 years ago, there wasn't any one sweeping standard for personal computers—which kept the I-2-3s and Hercules Graphics cards and so forth from appearing. The arena was just too confused. The IBM PC solved that problem by giving us a common ground for all that great software and hardware.

**DUAL DISASTERS** Those were the gifts; now for the disasters. After creating the 360 and making billions from it, IBM lost sight of the real source of its success (unity) and started creating a chaotic diversity by making all sorts of different compu-

## ■ PETER NORTON

ters—the Series 1; the 8100; the Series 32, 36, and 38; the Displaywriter, you name it—all of which were incompatible. That was a giant step backward, undoing the good that the 360 had done. Even the PC, a

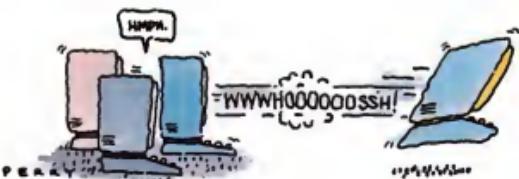
big success in itself, was a part of that larger failure.

Interestingly enough, America's number-two computer maker, DEC, has triumphed by undoing IBM-style damage.

DEC used to have a variety of machine architectures; now it has unified its machines—from desktop to mainframe—on the common architecture of its VAX machines. Smart move.

What went wrong for IBM is that it took its eye off the ball and built all those incompatible lines of computers. But although the PC is part of that failure, by itself it remains the biggest and most dramatic success that IBM has had in a long time—really it's the biggest success since the original 360 machines. However, in my opinion, IBM is busy messing up the PC's success just as it did the 360's.

Part of how IBM is messing up the PC family is easy to see: by trying to jam-fit it into its other product lines (with the 3270-PC, the AT-370, the RT PC, the System 36-PC); by producing deliberately crippled models (the PCjr, the 6-MHz AT, the



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■ IBM took its eye off the ball and built all those incompatible lines of computers. Although the PC is part of that failure, it remains IBM's biggest success.

PC-XT Model 286); by designing inferior models when it could produce superior ones (the Portable PC, the Convertible); and by not offering the best technology (no 386, no internal tape backup).

The key is that IBM had another 360-style opportunity: the chance to create a widely popular, unified world of computing. Now it is letting that chance slip through its grasp. IBM's loss of control over the future of the PC family is clearly demonstrated by both the high-quality cheap clones (particularly the Daewoo/Leading Edge Model D and the various Epsons) and the new non-IBM high-tech machines (particularly the Compaq Deskpro 386 and the Toshiba T3100).

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IBM no longer has control over the extended PC family, and that is the real "Worst of 1986."

**LOST AT SEA** I have been a career-long fan of IBM—a quite unashamed, rah-rah member of their Cheer Team. That my heart belongs to IBM is the emotional side of why I say that this is the worst of 1986. But there's a much more important reason why the demise of its control over the PC

■ A ship needs a captain, a company needs a president, and a technology needs guidance into becoming a useful standard.

standard is bad news: a ship needs the firm hand of a captain at the helm or it will be lost at sea.

The big success of the PC occurred because it provided a reliably stable base for all of us computer users to work around. But that stability becomes shaky when no one is defining the limits of what's standard. A ship needs a captain, a company needs a president, and a technology (like personal computers) needs someone to guide it into becoming a useful standard.

We now have a bunch of businesses all pushing and pulling on the PC family, moving it in various directions. While some benefits may result—more variety, more technical innovation—in the long run, I strongly fear that it will spread out the PC family into an unruly mob that is so confused and disjointed that we'll all lose out, because the PC standard will no longer be focused.

So I'm seeing a muddy future in the best and worst of 1986. Still, in the meantime, I'm going to enjoy the Toshiba T3100, the Compaq Deskpro 386, and those hot new Microsoft programming environments. I'm going to enjoy the Best of 1986 and hope I'm wrong about the Worst.

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### System Requirements:

Lotus HAL requires 1-2-3 Version 1A, Release 2 (Release 3.01 for personal computers), DOS 3.0 or higher, PCjr, PCjr II, and AT, and 256K of memory (512K for personal computers, DOS 3.0 or higher). Please refer to your 1-2-3 User's Guide or 1-2-3 documentation for appropriate hardware configurations and DOS requirements or consult your dealer.

Lotus HAL resides in memory with 1-2-3 and operates with it; a minimum system configuration of 512K is required.

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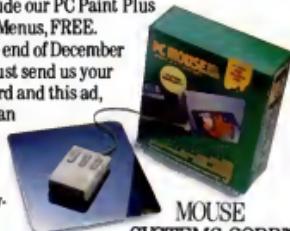
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■ JIM SEYMOUR

# BEYOND BIGGER, FASTER, AND MORE OF IT

*Changes in the way we use our PCs, and what our PCs can use, will take us beyond the limits of our present vision into a future we have barely begun to imagine.*

Part of the charter of this column is looking at where PCs—and the ways we use them—are going. I'll spare you the stock George Santayana quote, but if you haven't lived through at least a good part of the PC upheaval of the last few years, it's hard to get much perspective on where we're going. And you're destined to repeat a lot of other people's mistakes.

On the other hand, sorting out the tea leaves based primarily on extrapolations from the recent past leads to technologic myopia: while you're sitting there playing Darwin and watching things tidily evolve, you get blindsided by the genuinely revolutionary strides.

One of the most vivid examples of astigmatic forecasting in the PC industry grows directly from just that kind of "more of the same" analysis. From generation to generation of PCs and software (and soon, probably, from generation to generation of PC users), the crystal-ball people stare deeply, then pronounce that the Future will consist of doing pretty much what we've done all along, but with bigger programs, in more RAM, running along at more megahertz.

**BIGGER, FASTER, AND MORE** It's funny, somehow, that we so often fail to notice how making things bigger and faster sometimes actually makes them less well suited for their roles. (How would you like to drive, or drive behind, an 18-wheel tractor-trailer truck rig twice as long and going twice as fast as today's highway behemoths?) And we fail to notice, more im-

portantly, how such narrow vision completely misses the truly important sea changes around us.

While PCs are surely going to get bigger inside (if smaller outside) and will assuredly run faster, I think the epochal change we'll see over the next few years will be the integration of disparate tools into PC-based systems having far greater power and reach than we see today.

Since it's perfectly obvious that even with today's technology, PCs can't do anything literally by themselves but gain their usefulness only through linkages to software and peripherals, just what kind of "integration of disparate tools" are we talking about anyway?

**TRADING TOOLS** Here's my favorite example these days of how the power of PC-based tools can be multiplicative, not merely additive. Start with a stock PC AT: a nice, reasonably fast and powerful, if un-

exciting, PC. Put Lotus's *1-2-3* on the AT. We have a little something going here but nothing dramatic and certainly nothing new: Lotus is old news.

Plug in Lotus's Signal radio modem and accompanying software, and things start to get interesting. Signal constantly monitors a subcarrier band that carries stock market updates. You pick a list of securities, and Signal will listen for price changes and trading volume data on those stocks. The data can be swept into a *1-2-3* spreadsheet, where it can be manipulated as you wish.

This makes things more interesting but still not very dramatic: it's easy enough to track your portfolio and update values with many other programs, which go out through a communications program and ask Dow Jones News/Retrieval or Warner Computer Systems or The Source for current or closing prices, then update your portfolio. But stay tuned.

**AT ADDITIVES** Let's also put General Optimization's *What's Best* on that AT. *What's Best* is a linear-programming optimization package that reads *1-2-3* spreadsheets, analyzes zillions of variables, and optimizes results according to the rules you set. That can be as simple as detecting securities that have decreased in value to a predetermined point (the equivalent of a standing stop-loss sell order with a broker), or which have reached some multiple of your cost, or . . . you name it.

Finally, let's say you write a little link between *What's Best* and a communications program—that when certain True/


Illustration: Nacho Wilson

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## ■ JIM SEYMOUR

False. If/Then tests are met in the *I-J-3* spreadsheet that *What's Best* uses as an input/output form, the communications program calls your broker and issues buy and sell orders.

**TICKER TAKES** Remember all the noise on Wall Street this year about "programmed trading"? All the fears over "triple-witch" Fridays? And September's spectacular free-fall, when most stock

market analysts blamed the precipitous drop in market values on automatically issued programmed-trading commands emanating from investment houses' and mutual funds' mainframes? And how those mainframes, said to be running unbelievably complex programs to detect optimal sell points, were so dangerous because they were available only to the very richest firms?

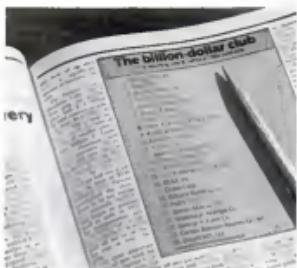
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**SYNTERGY SYMPTOMS** Actually, there's a weak link here: the temporary inability of most securities firms to promise the rapid execution of orders received directly from very many of their customers' computers, especially in the chaos of the last trading hour in a sharply falling market. But that's being fixed now; since the availability of such affordable and powerful automated market analysis and trading programs on PCs is no surprise to brokerage firms. Stock brokers understand very well that he who can rapidly execute lots of automated customer orders stands to gain a great many new customers.

When people start telling me about the synergy in their products—about how two and two are going to add up to about five and a half—I usually head for the door. But synergy really exists, despite the hype of those who try to claim its magic for some very mundane combinations.

If there is a prediction I offer at the end of this complex, promising year in the PC industry, it is that we are about to see the results of combining such powerful, disparate, and apparently unrelated products as these on PCs, which will take us far beyond the limits of Bigger, Faster, More-of-the-Same imaginations.



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When you work with a database program or most word processors, or any time you need to frequently load files into RAM or save them back, you are accessing your disk. It is such a pleasure to cut those times often in half and up to one-fourth.

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and saving. Recalculation speed is not affected.

Another plus — **LIGHTNING**™ fully exploits Above Board™ memory for PCs with that addition.

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**LIGHTNING**™, we simply  
have done a poor job  
explaining it to you.**

the lap portable market with ROM software such as Lucid spreadsheet and Write ROM that reviewers rated as excellent. We are proud to enter the IBM PC market with **LIGHTNING**™. It's a great product that we not only enjoy offering, but enjoy using on our own PCs. It will support IBM PC, XT, and AT.

This is an exciting program. A typical comment from **LIGHTNING**™ users is "I don't know how I ever did without it."

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IS BRILLIANT, WATSON,  
BUT WHERE ON EARTH DID YOU  
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■ STEPHEN MANES

# SANTA'S ELECTRONIC MAILBOX

*For generations, kids of all ages have delighted in the heartwarming tradition of sending their wish lists to Santa Claus. This year Santa invested in an MCI Mail account.*

**H**o, ho, ho, boys and girls! I hope you've been good all year long and eaten all your vegetables and backed up your hard disks the way your mommies and daddies told you to. Now let's get right down to all those requests in our little old electronic mailbox.

Oh, but first, let me remind you all to direct your instant letters to my official mailbox, under my full name—Santa Claus, not Kris Kringle or some such thing. And if you type *S. Claus*, be very sure you're sending your letters to me, the one at the North Pole, because there's another *S. Claus* in North Poland, Maine, and he won't forward your communications to me at all, the big meany. His first name's Salvatore, and he doesn't hang out with elves except when he's had a few too many, and I'm afraid, girls and boys, he won't come down your chimney at all this Christmas unless you cross him.

**SILLY BILLY GATES** Where was I? Oh, yes. Silly Billy Gates of Bellevue, Washington, writes that he wants 386 protected windows. You kids have such one-track minds! Last year Billy asked for 286 protected windows. I couldn't imagine what he was planning to do with all those windows except maybe build some kind of prison; so I brought him 88 windows without any protection at all.

But here he is back again with an even greedier request. Frankly, Billy, I think you have no more than a Frosty-the-Snowman-in-hell chance of getting your wish this year. But if you can't shake that monomania of yours and still want to build that

jail, well, just keep trying. You never know about next year and the year after that! Ho, ho, ho!

Last year Johnny "Green" Akers of Armonk, New York, asked for a convertible. Well, a little birdy told me that Johnny's been acting grumpy all year because none of his friends were very impressed with the one I brought him. This year, he wants a shinier, newer, more powerful model. Johnny, when will you learn that people like you for who you are, not what you drive? The way you've been acting all year, I suspect I may just have to bring you one of those gag THINK coffee mugs that doesn't quite have room for the K on it—either that or an XT 286.

**RRROR-CRRRECTON** Here's a puzzling note from one X. Q. Smrth of RRRR, MA, which I can't seem to find on my globe. It says, "Whrt R world lkke fr Xmas is fr MCR Marl to comm up wrth

some kmd of mrror-crrrecteon portocall." I wish Mrs. Claus and I could figure out what you're talking about, X. Q. The elves think maybe you should pay more attention to your studies in electronic handwriting class.

Last Christmas it was those cuddly little pet mice. Looks as though this time around a bundle of junior journalists have something to get off their chests. The toy of the year seems to be a "Desktop Publishing Set." Well, just let me say to all my little friends who asked for this one that the elves are working overtime to produce lots and lots of slugs of rubber type for all those cute little hand-cranked printing presses. You'll really get a thrill when your folks say, "Gee! At first glance I could have sworn this was *The New York Times*, not the *Cleaver Family Gazette*!" But don't blame me if the novelty wears off and the set is in the closet with the mouse by New Year's Day!

**STOCKING TEASERS** A new version of Rubik's Cube is out this year kids, but the best new brainteaser to stuff your stocking with has to be AST's new 3G-Plus EMS card. The word *ON* is prominently displayed on the back bracket. Your job is to dope out whether that word applies to the toggle switch right beside it, to the four DIP switches underneath, to neither, or to both. Skip the rest of this paragraph if you don't want to spoil your fun by learning the answer before Christmas morning. (Answer: the toggle switch obeys the *ON* marking. The DIP switches work the other way, and you can't be posi-



## ■ STEPHEN MANES

tive about them unless you open your PC and look around inside. Bet you didn't guess that one!)

Another novelty you electronic mops may get a kick out of lets your dot ma-

trix printer crank out those yellow hang-in-the-rear-window signs for your car. The one I printed up for the back of the sleigh says "JERK WHO BOUGHT ME THIS ON BOARD." That wacky cutup Ru-

dolph kept going around putting KICK ME versions of the signs on all the elves' backs until we threatened to tie his nose into the local power grid.

Incidentally, if any of you spot us overhead Christmas eve, you may wonder what happened to good old Blitzen. Well, kids, I'm sorry to report that he's been lured away by Borland's German division as a spokesdeer for his namesake spelling checker. Some of the elves think Philippe Kahn may be after my job the way he lavishes gifts like posters and thermos bottles and expensive champagne on the computer press. I keep telling them I'll start worrying when he grows a beard and stops sending out leather-bound copies of *Traveling Sidekick*.

The ever-thoughtful Mrs. Claus has just reminded me that some of you might not get this, so here's a hint: *Donner* means thunder in German.

**PRESS RELEASE** Now look at this letter, gang! Copies are addressed not only to me but to Peter Norton, John Dvorak, Stewart Alsop, the Easter Bunny, the Tooth Fairy, and the Ford Foundation. No chance I'll bother reading any further. It's obviously either a press release or some other kind of electronic junk mail. And don't kid yourselves, kids: the Easter Bunny and the Tooth Fairy feel exactly the way I do about this.

Whoops! Here's a fine howdy-do from Stevie Manes in Riverdale, New York. It seems that little Stevie's wonderful monochrome display went on the fritz right in the middle of his annual Christmas column, taking a little of the glow off his usual Yuletide twinkliness. The card and display are under the standard IBM carry-in warranty, but IBM insists he bring his whole PC along for the ride. IBM's crack technicians won't bend on this point, the Scrooges. "Company policy," they keep repeating.

So Stevie is going to have to disconnect his hard disk and printers and hope that the IBMers won't get mad about the turbo card in the box and pray that the insides won't get wet in the rain. Stevie is asking for some Christmas spirit so that he can wish both his readers the best of holidays. I am sending him the kind that comes in a crystal decanter.

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TURBO LIGHTNING

VOLKSWRITER 3

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WORD PERFECT 4.1

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WORDSTAR 2000+

WORDSTAR PRO

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IN A VISION

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MIS CHART

PC PAINT

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PFS: GRAPH

PICTURE PERFECT

SIGNMASTER

WINDOWS/DRAW

### Network Applications

DBASE III LAN PAK

KMAN 2

MULTIMATE

MULTIMATE

ADVANTAGE

OS/2 SYSTEMS

BASE 5000

REVELATION

SMAMA WORD III

WORD PERFECT SERVER

WORDPERF

STATION

CARD

HERCULES COLOR

HERCULES GRAPHICS

PACEMAKER MODULAR

TSENG EVA-CM-II

TSENG EVA 480

TSENG EVA 480 II

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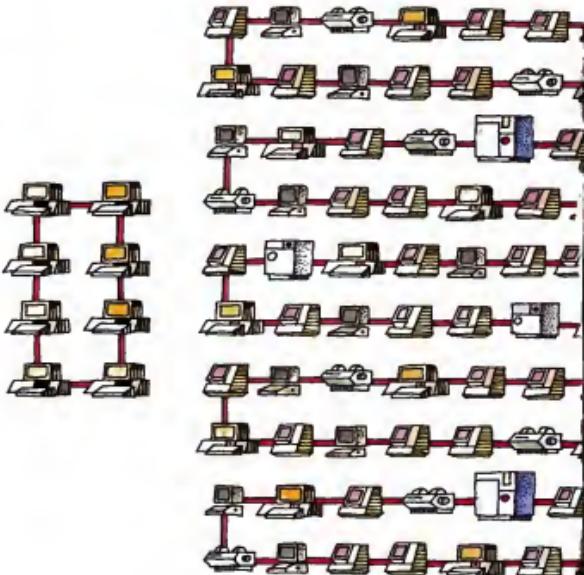
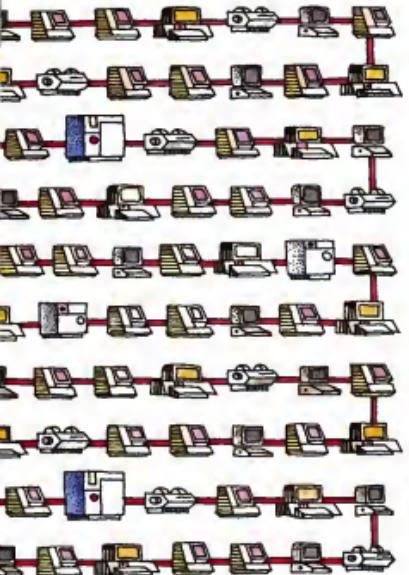
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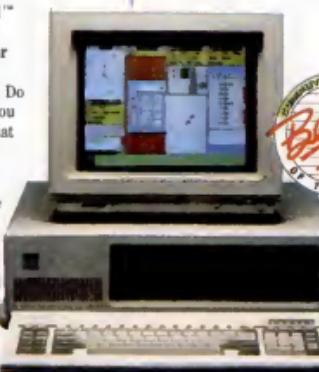
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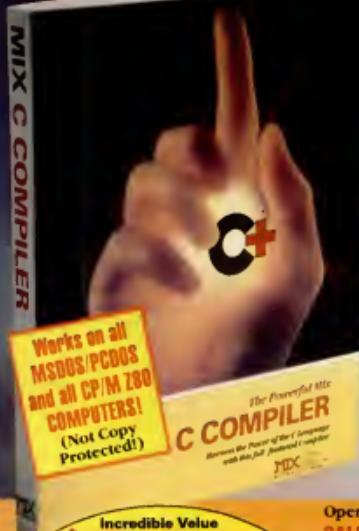
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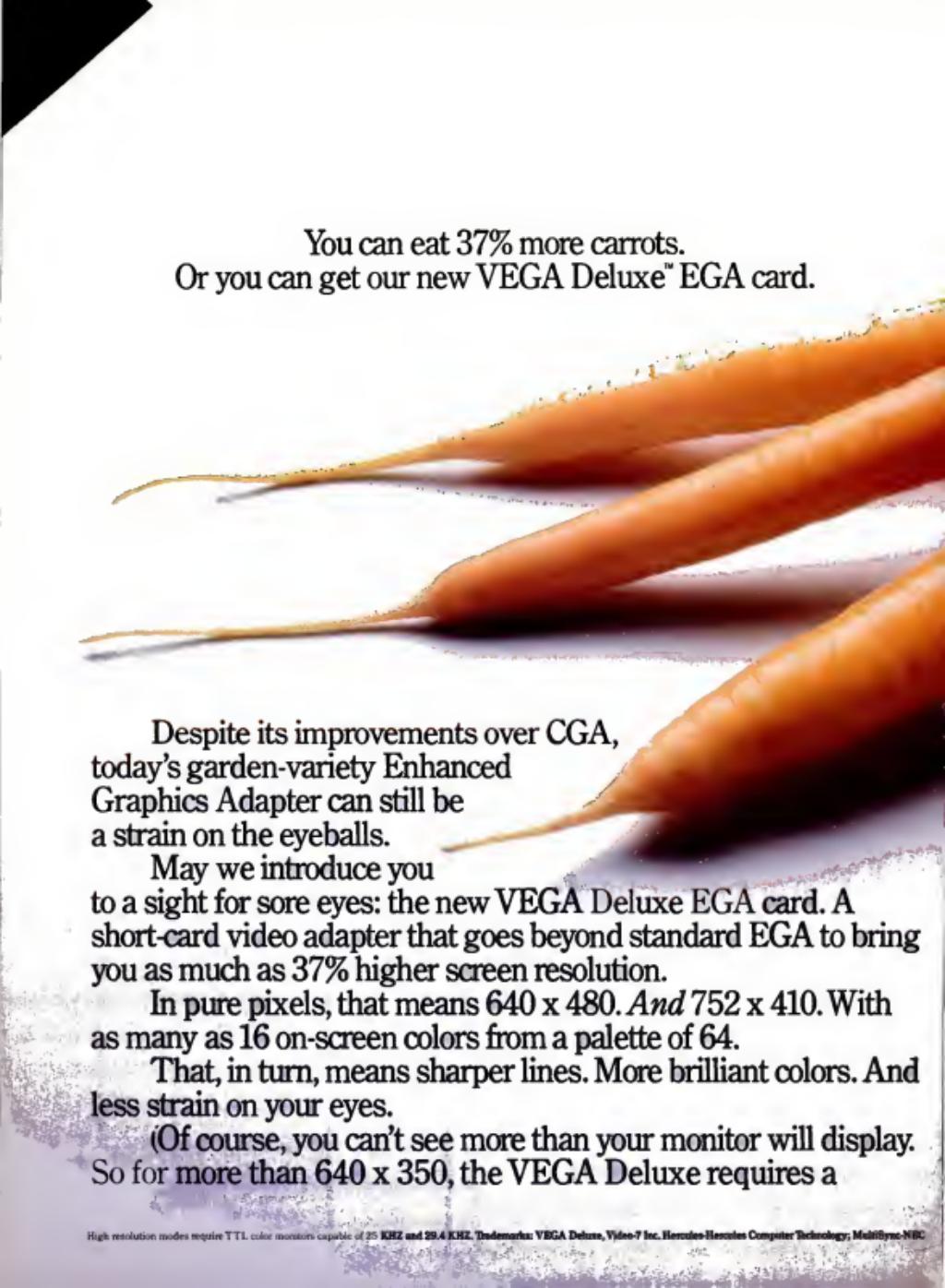
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## ■ STEWART ALSOP

# HIGH-TECH STOP & SHOP

*Compatible-PC designers are again reaching beyond mere IBM compatibility by trying to provide more features. Where do they get their parts? At the Asian CompuStop&Shop.*

I've never seen it, but I'm persuaded that somewhere, probably in Taiwan or Korea, there's a new kind of supermarket. It's probably called CompuStop&Shop. It's big, and it's open 24 hours a day. Grungy-looking guys in jeans, white shirts with pen protectors, brown loafers, and white socks roll shopping carts around. Instead of vegetables, dairy products, cereal, meats, and paper towels, this supermarket contains aisles of processors, memory, motherboards, ROM BIOSs, system units, specialty chips, and operating environments. Microsoft has a special little display near the checkout counter for operating systems.

(Actually, a supermarket in Silicon Valley called Fry's Electronics sells most of this stuff, plus other necessities like cases of Coke and Pepsi and boxes of potato chips.)

If you were to go out to your garage and make an IBM-compatible computer (it's all the rage these days, by the way), your first stop would have to be CompuStop&Shop. Which features would you pull off the shelf? This is an interesting question because, with some 200 or more makers of IBM compatibles, there are a lot of people trying to figure out just what it is that makes buyers choose one machine over another.

**FULL CIRCLE** Over the past 5 years, the process of designing IBM compatibles has come full circle. In the 2 years after IBM introduced its first PC in late 1981, most designers figured the problem was to design a computer that used the MS-DOS

operating system but that offered other features not available in the IBM. So the first so-called compatibles had faster processors or better graphics or were lighter or more movable.

But then everybody who didn't buy IBMs bought Compaqs and very little else. It turned out that compatibility wasn't a matter of being able to run the same operating system. It was a matter of being able to run the same version of major applications, most specifically Lotus's 1-2-3 and Microsoft's *Flight Simulator*.

For the next 2 years, the primary objective of designing IBM compatibles became compatibility. In other words, how closely could you make your computer act like IBM's? This resulted in a flood of computers that act so much like IBM's computer that you often can't tell the difference between brands except by the price tag, giving rise to the so-called commodity market for PC compatibles.



Now we've come full circle. Designers have gotten bored with just trying to copy what IBM did 5 years ago. So now they're working on trying to make computers do a little more than what IBM computers do. That little extra falls into several categories, all possible with parts that are available at CompuStop&Shop.

**THE FAST PC** This is a popular category, in which the designer pulls a faster-than-normal processor off the shelf. The options are an 8086 running at 6-8 MHz, a souped-up 8086 running twice as fast at 9.54 MHz, and an 8088-2 running at 7.17 MHz, all of which are found variously in the Toshiba T1100 Plus, the Wyse PC+, and the Amstrad PC. If you want to be particularly glitzy, you could opt for a fast 80286 running at 10-16 MHz; PC's Limited seems to be turning this into an art form. But the most-leading-edge thing to do is to pick up an 80386 processor running at a minimum of 16 MHz.

**THE BIG PC** This is also a popular strategy, particularly if you want to charge a somewhat higher price for your machine. Take a cruise through the CompuStop&Shop's memory and storage aisles and pick up a megabyte or more of RAM and nothing less than a 40-megabyte hard disk. Of course, if you want a big *and* fast PC, remember to get speedy RAM (120 nanoseconds, minimum) and a high-speed hard disk (19-millisecond access time is the new fashion, but you can get away with 35 milliseconds). Compaq, of course, is the past master at the big, fast PC.



## ■ STEWART ALSOP

**THE DESIGNER PC** This is a new approach that's gaining favor with underdog manufacturers like Wyse (PC286) and Toshiba (T3100), though it was invented by Grid Systems with its portable (and pricey)

GRIDCase. Kaypro followed the designer motif by building a low-cost GRIDCase clone called the Kaypro 2000. The idea is to skip CompuStop&Shop completely and design your own innards so they will fit

into a really slick package, preferably with black metallic casing, red plasma display, and other high-touch features.

**THE EASY-TO-USE PC** This twist was introduced by Tandy and extended to its limit by Amstrad (whose machine is currently available only in Europe, though more than 100,000 units were sold in its first month). This requires a stop in the operating environments section, where you have to choose between such components as Digital Research's *GEM*, *Microsoft Windows*, or a custom job such as Tandy's *DeskMate*.

**THE CHEAP PC** This approach is passé, since it merely requires the ability to read price tags on the components at CompuStop&Shop. Since Hyundai started selling computers to Caldor, there's just no challenge left in having the cheapest PC around.

**THE HI-RES PC** This is possibly the most difficult approach to building a different PC, since it involves dancing intricately through the anomalies of the four or five major graphics formats without blowing up the customer's software. Compaq defined the category by letting customers use CGA-style graphics on a built-in monochrome monitor. AT&T tried to push it further, with some success, by adding a nonstandard hi-res display standard to its PC 6300. AST Research has recently introduced the next logical step: a machine with a standard EGA-style display that can be upgraded to super-high-resolution display. But also watch out for Compaq's Deskpro 386 version of the EGA. It caches video ROM in RAM, allowing for souped-up screen updates—a creative combination of fast and high resolution.

**THE ULTIMATE PC** So far no one has been able to figure out how to build a big, fast, cheap, hi-res, designer PC. PC's Limited came close with its PC 286/16, but that machine is definitely not pretty. Compaq also came close with the Deskpro 386, but that machine is definitely not cheap.

Hmm . . . The Ultimate PC. I've got to be going now; perhaps I'll see you down at CompuStop&Shop.

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Operator:	EQ	GT	LT
Value:	Benson	1000	1000
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you can build a database structure with advanced features like computed columns, and searchable note fields. VIEWS that combine up to five tables in a single, powerful table. Data validation rules that check incoming data for errors. All without programming.

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- Aunt Betty's Sales Reporting System
- (1) Enter Sales Data
  - (2) Edit Sales Data
  - (3) Print Daily Sales Report
  - (4) File Processing
  - (5) Exit

For each menu choice, you assign an action. For example, to define

Transaction date: 01/01/86		Opn: B-25/86		
Transaction number: 48098				
Customer number: 668				
Name:	Specialty Processor Inc.			
Address:	4010 Industrial Way			
Phone:	555-1234	12355		
Stock #:	Brand:	Qty:	Price:	Extended Price:
207	Saxo-A-Batch-Cookies	85	2.00	170.00
308	Peanut Butter Crunch	200	2.50	500.00
818	Double Rich Brownies	250	6.95	1737.50

A data entry screen designed without programming, using Forms EXPRESS.

menu choice #3, choose the action "PRINT," select the report you just created in Reports EXPRESS, and specify the appropriate data sorting and selection criteria. Then Application EXPRESS automatically writes the program code.

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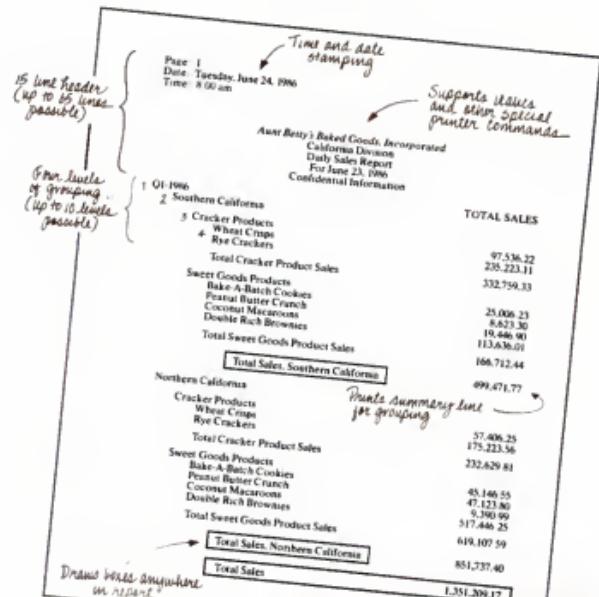
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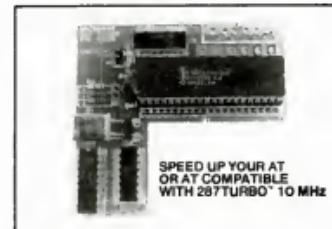
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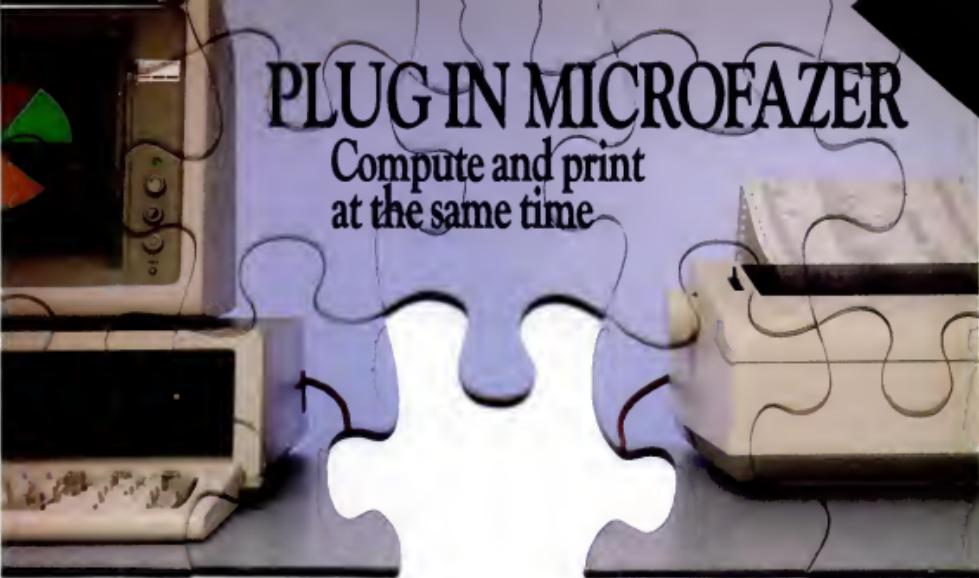
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## WHAT'S NEW IN PORTABLES

*Compromise is a thing of the past: The best of the new portables are better in every way than their predecessors. Their improved performance (even hard disks), more-readable displays, and dropping prices make traveling with DOS much more productive.*



Portable computers are back again, this time demanding to be taken seriously. In the short time since *PC Magazine* evaluated them ("DOS to Travel," *PC Magazine*, Volume 5 Number 13), these machines have evolved considerably. Then the worst was little more than an expensive toy; the best had simply too many compromises. Now many of them offer a serious alternative for your computing dollar.

Of the six portables reviewed here, two (the Zenith Z-181 Portable PC and the Toshiba T3100) are new since our first evaluation. The other four (the GRIDCase 3 Plus, the Toshiba T1100 Plus, the HP Portable Plus, and the Data General One/Model 2) are new or enhanced versions of machines that were already on the market.

The manufacturers of portable computers have listened to the demands of the market and responded accordingly. Six months ago, hard disks were not available on any computer under 15 pounds, and now they are either integral or options on three of the machines. Displays, once the Achilles' heel of several units, have been updated and enhanced, with good results. A case in point is the display technology on the new Zenith Z-181 Portable PC, which is so good that it will doubtless set the standard for LCDs.

Some keyboard layouts that could only have been described as cruel jokes have been totally redesigned or updated, much to the delight of anyone who types with more than two fingers.

Media choice is now much less of an is-

sue than it once was. The 3½-inch floppy disk drive is becoming the standard for portables, and more software is showing up in this smaller format. This standardization is due to two factors: first, the small drives are lighter, use less power, and provide greater storage capacity than 5¼-inch drives. Second, IBM Corp.'s entry into the market legitimized the 3½-inch format.

Unfortunately (for IBM), that's about all the IBM PC Convertible did for the marketplace. The machine, no longer new and never interesting, is not reviewed again here, though a recap is included. At least two of the machines we tested here are much better choices in terms of price, performance, and overall functionality. The PC Convertible simply isn't a serious contender for the lightweight crown.

**WHAT'S YOUR SIZE?** While the 3½-inch standard should eliminate a certain amount of confusion and make disk swaps among portables easy, you still need to find a convenient way to share data with your 5¼-inch-floppy desktop machine. Several alternatives are available, all of which will cost you some money.

One convenient but expensive possibility is to buy an external 5¼-inch drive for your portable. Transferring files by way of your modem is another possibility, but the need to convert your files to ASCII format makes this alternative less attractive.

To help make living with the problem easier, Toshiba gives you its PC Floppy Link, an interface card that enables you to use your PC's drive as an external floppy disk drive for its portables. Grid System Corp. and Hewlett-Packard Co. provide a way to send data from their portables directly to your desktop (in ASCII format) via a special cable and software.

In a move that might prove to be the best combination of price and convenience, Toshiba has introduced a 3½-inch drive kit for desktop machines that includes the drive and all the necessary mounting hardware. The product is priced right (\$150), though it means that some AT users might be faced with the prospect of needing both low- and high-capacity 5¼-inch drives as well as the 3½-inch drive. Another win for Tower of Babel technology. (For more information, see the accompanying sidebar "From Laptop to Desktop.")

**YES, NO, MAYBE** Yet the fact that all the machines tested, with the exception of the HP Portable Plus, have opted for the 3½-inch format doesn't really make your buying decision that much easier. The range of capabilities and options, and intended markets, varies greatly from machine to machine. At one end you have the relatively inexpensive (and excellent) offerings from Toshiba and Zenith, with few configuration options. At the other end is the super-high-tech approach from Grid System, with its seemingly endless range of configurations.

The best approach to buying is to know what you want to do with a portable before you start shopping. Do you need to run *Framework* or *Symphony* from a hard

## FROM DESKTOP TO LAPTOP

*What good is a portable computer without a means of transferring data to and from your PC?*

You plunked down a couple thousand dollars for a new laptop computer, but, before you take it on the road, you need to transfer all the data from your desktop PC. Unless you followed the IRS down the path of least resistance and bought a laptop with 5¼-inch floppy disk drives, you have a problem.

Solutions include buying 5¼-inch floppy disk drives for your laptop or 3½-inch drives for your desktop PC, connecting your laptop to a desktop PC via the serial ports, and using data transfer services. This service is available from several sources including a dealer who will download your data to a 5¼-inch drive on his demo unit, a users group providing this service for its members, or a commercial service such as those that advertise in the classified sections of computer publications. Charges can run as high as \$25 per disk, making this an expensive method if you have a lot of data to transfer. Also, many services will refuse to transfer commercial software for fear of copyright infringement. This method is a last resort for most users.

IBM recommends adding a 3½-inch floppy drive to your PC to make 3½-inch disks for your laptop. This system has two advantages: you can use familiar DOS commands to copy files and format disks, and this type of disk-to-disk transfer is fast.

Fortunately, most of the laptops use the same 3½-inch disk format, and it's unlikely that future laptops will require you to buy yet another disk drive. These drives are available from IBM and several laptop manufacturers.

Unfortunately, this solution may not be available to you if your desktop computer is a PC compatible. The 3½-inch drive connects to the DB-37 connector on the PC's floppy disk controller, and, if your compatible does not have this connector in its rear plate, some of the exter-

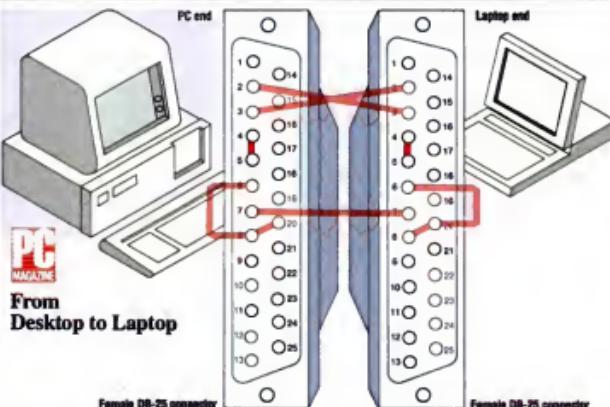
nal drives cannot plug into it. Similarly, old PCs with a 63.5-watt power supply may have some problems with internal drives if there are other expansion boards inside the system.

**FLOPPY FORCES** The other disk-to-disk solution is to buy a 5¼-inch floppy drive for your laptop from its maker. Like the 3½-inch drive on a PC, the 5¼-inch drive uses standard DOS commands to copy files and format disks. The 5¼-inch drive will also allow you to run some copy-protected software that cannot be transferred to 3½-inch disks.

When deciding between these two, look at your application, organization, and at your work habits. If your organization has a large number of desktop PCs and a few laptops that you can check out as needed, then 5¼-inch drives for the laptops make sense. Using 5¼-inch drives is also preferable if the laptop is your only computer or if you exchange data with other computer users in the field. If the laptops are used to collect data in the field that is then sent back on disk, a 3½-inch drive at the central site will save money and the trouble of carrying the 5¼-inch drive into the field. Since the 3½-inch drive holds twice as much data as the standard 5¼-inch disk and is part of the desktop PC, it's more convenient to transfer large amounts of data directly from the hard disk to the 3½-inch floppies without the 5¼-inch floppy as an intermediate step. Splitting up a 400K database just for the transfer can be very frustrating.

Adding either drive is expensive, ranging from \$250 to \$500. If you can't justify that kind of expense, you need a less expensive solution.

Communications solutions to the PC-to-laptop data transfer problem range from sending a document via MCI Mail from the laptop and retrieving it on a PC,



**PC  
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## From Desktop to Laptop

to using special hardware and software solutions that use standard DOS commands to copy the files. The thing that all these solutions have in common is that the laptop communicates with a PC via their respective serial ports.

**LAPTOP LINKUPS** To make this kind of connection, you obviously need both a desktop PC and a laptop. You also need either a pair of modems or a special cable called a null modem. The PC's serial port is intended to connect to a modem; if you want to connect two PCs together, you need to fool them so that they each think they're connected to a modem.

Some laptops use special connectors to save space. If yours uses such a connector, you'll need to get either a laptop-to-PC cable or a cable to make your laptop serial port look like a standard PC port. If the serial ports on your PC are all used, you may want to get an A-B switch if you transfer often, to save the effort and wear on the cables of connecting and disconnecting them.

The null modem cable (shown above) fools both computers into thinking they are connected to a modem. These cables are available from custom cable houses

and most laptop dealers for about \$35. This diagram assumes that the laptop has a serial port with the same pinout and connector as that of the IBM PC. Check with your laptop manual or dealer before making this cable. In a 9-pin connector, the equivalents to the 25-pin connector are as follows: 1 to 8, 2 to 3, 3 to 2, 4 to 20, 5 to 7, 6 to 6, 7 to 4, 8 to 5, and 9 to 22.

An alternative to making a null modem cable is using a device called a smart cable. Made by IQ Technologies of Bellevue, Washington, this \$75 special cable has circuitry in it that figures out the special configuration needed to connect the devices at its ends. (Smart cables are also good for connecting serial printers to your laptop.)

Once you have the two machines connected by a cable, you need communications software on both machines to transfer the data. Most standard communications programs, like *Crosstalk* and *Relay*, support one or more error-checking protocols so that you can be sure that the data arrives on the 3½-inch disk intact. Since some laptops, the Data General One/Model 2 in particular, use a different UART serial port controller chip than the

PC-232 serial port spec was created to clarify the connections between terminals, called data terminals or data terminal equipment (DTE), and modems, called data sets or data communications equipment (DCE). Ideally, to connect a DTE device to a DCE device, all you need is a cable with pins 2 and 25 pins straight through. This can make things difficult when you want to connect two DTE devices, like PCs, together.

Since DTE devices transmit on pin 2 and receive on pin 3, the first thing you need to do is connect PC A pin 2 to PC B's pin 3, and vice versa. Next, connect the two pin 7's (this creates the ground between the two machines). The hard part is connecting the handshake lines so that the two machines know they're connected to that's ready to receive data.

Pin 5 is called *clear to send* (CTS). The modem sends this signal when it is ready to receive data; the PC has a corresponding signal, *ready to send* (RTS), on pin 4, which it sends whenever it is ready to send data. If you connect pin 4 to pin 5, then the PC will see that the null modem is ready to receive whenever the PC is ready to send.

Pin 6 is called *data set ready* (DSR), which is the signal a modem sends whenever it is in a ready state. On pin 8 is the *carrier sense* (CSD), which a modem sends when it has detected the carrier signal from another modem that it can receive. The PC generates a signal called *data terminal ready* (DTR) or pin 20. When you connect pin 20 to pins 6 and 8, the PC thinks that the null modem is connected and ready. Now the PC can send and receive data to and from your laptop.

PC uses, you may need a special version of a communications program. Other laptops are more compatible, and with them you could use a copy of the PC version that someone else, such as your dealer, downloaded for you.

Data General has a solution to this problem: software called *PC Liaison*. This package includes the cable and the software for both the PC and the Data General One/Model 2. The software makes the disk drives on the PC look like additional drives on the Data General One; so standard DOS commands can be used to transfer the data. *PC Liaison* costs only \$95, including all the software and the cable. Other laptop makers would be wise to follow Data General's lead.

*PC Liaison*, or a similar product from another laptop maker, is the communications system of choice. This method uses standard DOS commands and has all the advantages of the extra disk drive at one-fifth the cost. In fact, it costs less than even the less convenient communications methods.—Howard Marks

**Howard Marks** is a New York-based communications consultant.

## ■ NEW PORTABLES

disk? Do you need a display that several coworkers or clients can gather around to watch a dazzling presentation? Or do you want a high-powered (but smaller) replacement for your present desktop? Any or all of these options are possible with the machines we examined.

Since compatibility is not an issue, your buying decision will probably come down to weight, display quality, keyboard quality, battery life, and price. The features table should make your comparison shopping a little easier.

One other point to consider is whether you need a laptop at all. If your requirements are limited to word processing and modest spreadsheet use, a less expensive, less heavy, notebook computer like the Tandy 102 or the NEC Starlet might be a better choice (see sidebar "Traveling Light"). Another factor in favor of notebook computers, which generally don't have disk drives, is that their batteries tend to last for about 20+ hours, which is much longer than any of the portables' batteries will continue to work, except for those of the diskless 4P Portable Plus, which has about a 20-hour battery life.

### PC EDITOR'S CHOICE

*How could the Toshiba T1100 Plus not be an Editor's Choice? Toshiba fixed everything we found deficient in the original T1100, then made it twice as fast. The Zenith Z-181 Portable PC is a clear winner, too. The display sets a new standard for all portables, and the rest of the machine is top-notch as well. The Most Improved award goes to the GridCase 3 Plus. Not everyone needs a hard disk and battery power, but the GridC's got it. Comparing the Toshiba T3100 with the other portables is a classic apples-to-oranges situation. But as a competitor of the Compaq Portable II, the T3100 accomplishes roughly the same feat in one-third the space. Still, for a breakthrough machine, the hard disk is too slow and the screen's contrast is poor.*

The reviews that follow are evidence of just how far portables have come in the last 6 months. No machine here weighs over 15 pounds; most are under 12. They are better in almost every respect than their predecessors, and prices continue to drop. But perhaps the most telling factor is the *PC Magazine* Editor's Choice.

Last time they reviewed portables, *PC Magazine* editors felt that no machine merited the Editor's Choice award. But now the issue isn't that *no* machine is good enough, but rather that *two* machines are that good. What follows, in ascending price order, are reviews of six laptops.

—Jon Pepper

### Toshiba T1100 Plus

The original Toshiba America portable, the T1100, was extremely engaging. While it may have lacked the visceral appeal of Grid Systems Corp.'s GridCase 3, the Toshiba T1100 was small, lightweight, and reasonably priced. Moreover, it ran most DOS applications without problem, and its battery seemed to last forever. In fact, the Toshiba T1100 was so appealing that I immediately made it my portable of choice for plane trips, a decision that caused my diskless NEC Starlet laptop to be consigned to the uncharted reaches of my office, from where it has yet to emerge. Unfortunately, the T1100 had one fairly serious drawback: a keyboard layout so illogical that it would have made Mr. Spock's orderly Vulcan mind go off the deep end.

Toshiba reacted quickly to the feedback



on the T1100 and introduced the T1100 Plus, remedying the poor keyboard and adding several new features. Standard equipment on the T1100 Plus includes two 3½-inch disk drives, 256K RAM, and a dual-speed CPU—all in a package of almost identical size and weight to the sin-gle-drive T1100.

**ALL KEYED UP** The real news about the T1100 Plus is the total redesign of the earlier model's keyboard. At last, in the new, sensible layout, the function keys are now arranged in a single row across the top of the keyboard, with the NumLock, ScrollLock, PrtSc, and SysReq in a separate grouping along the same row. The cursor keys are in an inverted T at the bottom right, and the Home, PgUp, PgDn, and End keys are arranged in a vertical row above the cursor keys.

The feel of the keyboard is good, too, with a natural key-click sound and a firm, positive tactile response. The feel of the keyboard, as well as the normal-size spaces between the keys, make typing on the T1100 Plus about the same as typing on a full-size keyboard. The only complication, however, is that you need to use a three-key combination (Alt-Shift and either the Semicolon key or the P key) to generate the code for the large, gray Plus and Minus keys on the IBM keyboard. But that's a small price to pay for using this machine.



*The Editor's Choice Toshiba T1100 Plus improved upon all the shortcomings of the original model. Its keyboard (pictured above) has been logically redesigned and provides near-PC quality feel.*

## ■ NEW PORTABLES

**SPEED AND GOOD LOOKS** The T1100 Plus sports some other improvements, too. It features an 80286 microprocessor that runs at either 4.77 or 7.16 MHz. At best, most portables operate at the standard (4.77 MHz) IBM clock speed. At worst, they plod along even more slowly. Adding the faster CPU speed to the Toshiba really makes a difference: Only the 286-powered Toshiba T3100 surpassed it on PC Labs' benchmark tests. You can toggle between the speeds with a combination of Ctrl-Alt and PgUp or PgDn; the faster speed is the default setting, and none of the software that I ran re-

quired the slower 4.77-MHz speed.

Several soft "switches" use the Ctrl-Alt combinations: processor speed, character display (one- or two-pixel rows), LCD or CRT display, and toggling the embedded numeric keypad. These switches worked well from within applications programs; they tended, though, to drive *Sidekick* a bit crazy during testing. LEDs at the top of the keyboard indicate processor speed (green for high and red for low), which of the two disks is in use, whether the CRT or the LCD is selected (which should be pretty obvious), and low-battery condition.

The T1100 Plus's LCD is identical to that of the T1100. While not in the same league as the GRIDCase LCD, the Toshiba LCD holds its own against any of the other LCDs. The display is infinitely adjustable back to completely horizontal—a major convenience when you're using an external monitor—and it's quite legible. The display's contrast control adds measurably to the overall legibility.

**NO EXCEPTIONS** When it comes to performance, the Toshiba is a leader among the portables. Admittedly, it's not as quick as the Deskpro Compaq 386, but try folding that up and using it in the passenger seat of a Fiat that's snaking, full tilt, through the Swiss Alps. The Toshiba worked fine under those conditions.

Two minor performance handicaps are worth mentioning. First, drive performance is torpid, a problem still endemic to all portables. Second, some software might require a bit of attention to install because certain color palettes show on-screen as black on black. A utility called CHAD (for CHAnge Display) changes the screen attributes to show those combinations on the LCD.

Otherwise, the Toshiba is a champ. It ran a broad selection of applications beautifully, including *I-2-3*, *WordPerfect*, *Multimate*, *Javelin*, *CrossTalk*, and *XyWrite*. No question, the Toshiba T1100 Plus's good design and solid construction, with parallel, serial, RGB, and composite connector, and space for an internal 300/1,200-bit-per-second modem, make it a leader in its class. In addition, the T1100 Plus's documentation is excellent, and Toshiba also offers an Exceptional Care

### COUNTER POINTS

• It is hard, but not impossible, to improve upon this great machine. Ideally, it would have a screen like the Z-181 and a power-down feature like the one on the IBM. Here's to wishing for a battery-powered 80286 version with a hard disk, but meanwhile I'll keep my T1100 Plus.—William G. Wong

• Everything that was a problem with the original T1100 has been fixed: the crazy-quilt keyboard layout, the single disk drive, the 300-bps modem, and the 512K RAM limit. Toshiba has three advantages over the Z-181: smaller footprint, faster processor, and longer battery life. IBM, eat your heart out.

—Bill Howard

• This machine flies in the face of the conventional wisdom that the Japanese don't know how to listen to their American market. It gives you more computing power in less space than anything else out there. The best keeps getting better.—Bill Macrone

• Who cares how small the thing is, or how fast. If you can't read it, what's the point? You don't need awesome processing speed on a jet or a train, you need something that can handle dim light. Staring at the Toshiba's murky gray-on-green screen is like trying to read a bad photocopy underwater, and the squashed screen aspect only makes it worse. The keyboard has a good feel, but it shoehorns too many keys into too little space.—Paul Somerson



### FACT FILE

Toshiba T1100 Plus

Toshiba America Inc.

Information Systems Division

2441 Michelle Dr.

Tustin, CA 92680

(714) 730-5000

List Price: With 256K RAM, two 3½-inch floppy disk drives, parallel/serial ports, monochrome and color monitors, \$1,999; 640K RAM version, \$2,399.

In Short: A great computer. A fine balance of size, weight, performance, and price that is a true standout among portables.

CIRCLE #679 ON READER SERVICE CARD

Program, which will get you an overnight replacement for a defective computer.

The \$2,399 list price for the 640K-byte model is pretty reasonable, especially since several large mail-order companies are offering discounts. Realistically, though, you probably also will want the external 5¼-inch disk drive (at \$525) and

## Zenith Z-181

### Portable PC

I don't know about you, but I just don't see how people can use digital computers with displays that are less readable than the digital watches on their wrists. And yet you see such long-suffering users everywhere, twisting Tandy and Toshibas and even an occasional IBM PC Convertible into the light in a futile attempt to read what's on the screen.

It's bad enough they can't see what they're doing; victims of Data General and HP keyboards can't even type in the information to begin with. It's as if the engineers of those machines used the original PCjr keyboard as a model and then decided to cut some corners. They ought to pry out the chips inside of these computers and grind them back into sand.

But the legions of peripatetic writers, salesmen, accountants, and engineers who ache for a decent road PC don't have to the modem (for another \$399).

In sum, while the T1100 was engaging, the additions to the T1100 Plus have made it almost irresistible.—Jon Pepper

## ■ NEW PORTABLES



### Portable Computers: Summary of Features

Product	List price (ms. config.)	Measurements		Screen		Type	Readability	Co-travel	No-gleare	Keyboard		
		Size* (HxWxD in inches)	Weight (lbs.)	Size (HxW in inches)	Horizontal/vertical† (degrees)					Feel	Roll-over	Lay-out
Detavee 2511	\$1,695	18.5x12.8x6.3	16.23 (hard disk)	5.5x11.5	LCD (standard, backlit fluorescent, or gas!!)	NR	110/45	1	NR			
Data General Des/Model 2 (LCD)	\$1,795	2.75x11.6x13.6	13.7	6.25x7.75	LCD	●	110/80	Inf.				
Sharp PC-7000d <sup>††</sup>	\$1,795	8.5x16x6	18.51	4.5x9.5	Backlit LCD	NR	110/50	8	NR			
IBM PC Convertible <sup>††</sup>	\$1,995	2.7x12.8x14.7	12.5	4x18.5	LCD	NR	110/30	8	NR			
Keypro 2888 <sup>††</sup>	\$1,995	2.3x13x11.5	12.82	4x9	LCD	NR	110/30	8	NR			
PC Toshiba T1188 Plus	\$1,999	2.6x12x12.1	9.9	4.7x9.1	LCD	○	80/118	Inf.				
Zenith Z-171 PC <sup>††</sup> (formerly Z-178 PC)	\$2,399	9.5x12.6x8	14.48	4.5x9.5	Backlit LCD	NR	110/30	4	NR			
PC Zenith 2-181 Portable PC	\$2,399	3x13.5x11.75	11.5	9x8	Backlit LCD	●	110/150	Inf.				
Panasonic Exec. Partner FT-78 <sup>††</sup>	\$2,595	5.3x16x21.3	30.39	6x7.5	Plasma	NR	150/150	8	NR			
HP Portable Plus	\$2,695	3x10x13	9.5	4x9.75	LCD	●	110/60	0				
Data General Des/Model 2 (EL)	\$2,795	2.75x11.6x13.6	12.6	4.75x7.75	Electro-luminescent	○	150/158	Inf.				
GridCase 3 Plus	\$3,290	2x11.5x15	13.1	4x9.5	Plasma	○	150/150	2				
Compaq Portable II <sup>††</sup>	\$3,499	7.5x17.5x13.8	26.96	5.5x7	CRT	NR	150/150	0	NR			
Toshiba T3100	\$4,499	2x11.5x12	14.8	5.9x7.7	Plasma	●	150/150	Inf.				

—Indicates Editor's Choice. ●—Yes ○—No NR—Not reviewed (pick-up review; product not tested for this feature). Inf.—Infinite \* All laptops measured with case closed.

† Indicates two arcs—horizontal, extending to the left and right of the screen's center point; vertical, extending above and below it—define the angles from which the screen is legible.

†† Indicates pick-up review from Volume 3 Number 13 (July 1986).

take such abuse any longer. Zenith, whose repackaged Morrow Pivots won a highly publicized contract with the IRS earlier this year, has just released the first truly usable laptop.

The Z-181's Supertwist backlit LCD screen is awesome—rich, crisp, shocking-blue text and graphics against a luminous white background that's the same shape (and nearly the same size) as a color CRT. You can swing the bright, rock-steady display through an arc of 150 degrees, and can vary the brightness and contrast easily by adjusting two sliding switches on the top panel.

While other LCDs are so gloomy and squinty that you have to twitch your head up and down to read the top and bottom of

your screen, the viewing angle of the Z-181 is so wide you can almost read it from behind. (You really have to see the high-contrast throbbing blue display in person to believe it, especially under normal or slightly dim light. I almost caused a riot on a DC-10 when a dozen executives leaped out of their seats and clustered around it in awe after I snapped it on. Some had seen its nonpareil screen from a dozen rows back. Try that with a Toshiba. In fact, try working on a darkened airplane at all. No problem for the Z-181.)

A solid, full-travel 75-key keyboard is a cut above all the rest; only the cramped Toshiba comes close, but it jams too many keys into too small a space. The Zenith's generous amount of real estate allows a far

more intelligent key layout, including a diamond-shaped cursor pad. However, the designers should have positioned the Ctrl key adjacent to the A key where it belongs; instead, it's one space too far to the left, and directly above the Fn key. This is potentially hazardous, since Ctrl-ScrollLock issues a break instruction while Fn-ScrollLock triggers a print-screen attempt. If you don't have a printer attached (and few travelers do), an errant finger groping for a break can lock up the system.

Two relatively speedy, pop-up 720K 3½-inch shock-mounted drives shuttle your programs and data in and out of memory. With 640K of no-parity RAM standard, it's a good idea to set up a large RAMdisk and copy everything you'll need

Portability		RAM Size				Hardware Configurations							Vendor-Supplied Software		
"Lap-ability"	Battery operated	Battery discharge time (hours)	Battery recharge time (hours)	Minimum	Maximum	As tested	Built-in disk drives	Micro-processor	Speed (MHz)	Expansion slots	Built-in modem (bps)	Serial port	Disk-based	ROM-based	
NR	●	1 (backlit), 2 (not backlit)	6-8	256K	1.25 Mbytes	768K	hard disk 2 3/4" floppy disks 5 1/4" floppy disk	80C88	4.77	1 proprietary	1,200	●	○	Communications	
■	●	8	12	256K	640K	512K	3 1/2" floppy disk	80C88	4.77	2 mini slots	○	●	○	○	
NR	○	120/220-volt only	No battery	384K	704K	384K	2 3/4" floppy disks	8088	7.37	2 proprietary	1,200	●	○	○	
NR	●	6-8	8	256K	512K	512K	2 3/4" floppy disks	80C88	4.77	1 proprietary	1,200	○	Editor, communications	○	
NR	●	4-6	24	768K	768K	640K	floppy disk	NEC V20	4.77	1 proprietary	300/1,200	●	Editor, communications	○	
■	●	7	8	256K	640K	640K	2 3/4" floppy disks	80C86 dual speed	4.77/7.16	1 for internal modem	○	●	Sidetech	○	
NR	●	2-3	8	256K	640K	512K	2 3/4" floppy disks	80C88	4.77	1 proprietary	300/1,200	●	BASIC	Communications, appointment calendar	
■	●	3-5	8	640K	640K	640K	2 3/4" floppy disk	80C88	4.77	○	○	●	○	Diagnostics, debugger	
NR	○	120-volt only	No battery	256K	640K	256K	hard disk 2 3/4" floppy disks	8088-2 dual speed	4.77/7.16	1 PC bus-compatible 1 proprietary	○	○	○	○	
■	●	20	12	256K	512K	256K	○	80C88	5.33	2 short	○	●	○	Diagnostics, HP Link	
■	●	1-2	12	256K	640K	512K	3 1/2" floppy disk	80C88	4.77	2 mini slots	○	●	○	○	
■	●	1-1½	12	128K	640K	640K	3 1/2" floppy disk	80C86	4.77	1 combination	300/1,200	●	○	○	
NR	○	120-volt only	No battery	640K	8 Mbytes	640K	hard disk 5 1/4" floppy disk	80286	8	2 PC bus-compatible	○	●	BASIC	○	
■	○	120-volt only	No battery	640K	2.6 Mbytes	640K	3 1/4" floppy disk 10-Mbyte hard disk	80286	8	1 short	○	●	Sidetech, SuperKey	○	

—Excellent    —Very Good    —Good    —Fair    —Poor

into it, which speeds up the works and reduces battery drain. If you go easy on disk accesses and don't keep the screen cranked up to full brightness (it dims automatically after 2 minutes of idleness), you can nurse almost 5 hours of operation off one charge.

Unfortunately, while this is acceptable for short hops, if you're on a cross-country flight you'll have to bring along the charger and finish your work in the bathroom. It's optional 300/1200-baud internal modem and 8087 math coprocessor are power pigs as well; a fully loaded system running floppy-intensive applications can run out of juice in just over an hour. And while you can bring along other NiCd battery packs, they're heavy and not so easy to handle. Zenith ought to have encased

the replacement packs in snap-in cartridges. You can, of course, plug the machine into a wall socket and use it while the internal batteries are recharging. A full internal battery recharge takes about 8 hours; an external charger will get a second battery pack ready in just under 2. For some bizarre reason, however, the transformer brick is at the computer end of the power cord rather than at the wall end.

Also, the computer should have audible alarms. When you're down to 3 minutes of battery life, it's too easy to miss the small, red warning LED between the two drive in-use lights or confuse it with a disk access. The thing should beep annoyingly. And it should squeal when you close up the lid without shutting it off (like the

Toshiba), or when something accidentally jostles the power switch into the on position while the machine is packed away.

As long as we're dreaming, CapsLock/NumLock status lights would have been handy, as would a miniature hard disk. And if Toshiba can pack higher-performance CPUs inside its boxes, there's no reason for Zenith to have crippled the Z-181's performance with its garden-variety 4.77-MHz CMOS 8088. (Both the hard disk and beefier chip are scheduled for 1987 release; a 2400-bps modem may be available slightly before then.) Finally, while 11.8 pounds isn't very much weight considering that the only real competition is a Compaq with a CRT, it starts to feel like 11.8 tons after schlepping it through

## ■ NEW PORTABLES



The incredibly legible screen, the excellent, large keyboard (pictured below) and a decent performance, make the Zenith Z-181 Portable Computer a PC Magazine Editor's Choice.



airports all day long.

But the laptop overall is so well made, the keyboard so responsive, and the screen so astonishing that you somehow don't mind. A battery-powered clock, serial and parallel ports, RGB output, and a connec-

tor that can handle up to two external drives are standard. Zenith also tosses in firmware diagnostics and debugging programs and lets you customize just about every aspect of operation through shifted function-key commands—which lets you flush the keyboard buffer, toggle between LCD and RGB output, shift color palettes in midprogram, and simulate F11, F12, and SysReq.

Okay, so it's not perfect. The skimpy manual needs a lot of help, and the minor

but irritating design flaws mentioned above are scheduled to be remedied early next year. But just about all the competition is wretched. If you can stand a squashed gray-on-gray image, the Toshiba T1100 Plus gives you more raw power in a daintier package. But if you like well-designed keyboards and want to read what you're typing, Zenith's 181 is the only game in town.—Paul Somerson

## HP Portable Plus

I generally tend to support the contrarian philosophy that says anything running counter to conventional wisdom is probably the right choice. That's the philosophical way of saying that 50 million Frenchmen not only could be wrong about something, but that they probably are. It follows, then, that I should like the HP Portable Plus simply because it has numerous conceptual and design differences from the other machines tested. The reality of working with it, however, is an argument in favor of conformity.

All the other portables tested included one or two integral disk drives and are intended primarily to run disk-based applications software. When Hewlett-Packard's designers thought through the Portable Plus, they decided that neither of those requirements was absolutely necessary. As a result, the only way you can use a disk drive with the Portable Plus is to hook up the optional 3½-inch external unit. The HP designers apparently put a premium on portability, durability, and convenience, and, by those standards, leaving out a mechanical disk drive may make some sense. After all, the disk drive is the part of the system that is always the most susceptible to failure, requires a lot of precious battery power, and, in most portables, runs tortuously slow. In its place, HP included an electronic disk drive, known as the E-disc, and room for a fair amount of ROM software. The result is a portable that is rugged, fairly swift, and—with some qualifications—easy to use.

The Portable Plus looks like a notebook computer with a mild weight problem. At under 10 pounds, it's heavy for a notebook computer but light compared with the other laptops. Functionally, it's a little bit of both. Opening the top of the Portable Plus



### FACT FILE

#### Zenith Z-181 Portable PC

Zenith Data Systems Group  
1000 Milwaukee Ave  
Glenview, IL 60025  
(800) 842-9000

**List Price:** With 640K RAM, two 3½-inch 720K floppy disk drives, parallel/serial ports, RGB output, power supply/battery recharger, external drive connector, firmware diagnostics and debugger, \$2,399; internal modem (300/1,200 bps), \$399.

**In Short:** While it's true that some laptops are more compact, and some are faster, Zenith's extremely keyboard, intelligent styling, and design, and astonishing screen make it a clear winner. Its performance isn't bad, and it proves once and for all that speed by itself doesn't mean much if you can't read the screen.

CIRCLE #79 ON READER SERVICE CARD

### COUNTERPOINTS

• The Z-181 has the best screen I've seen on a laptop. The others better get on the ball or there may be no contest.

—William G. Wong

• Supertwistedbirefringentexpialidocious!—Bill Machrone

• At the affordable end of the DOS-to-travel spectrum, the choices boil down to two: the T1100 Plus or the Z-181. Buy the Zenith if you're willing to trade off some battery life to get that excellent display. This is the machine the IRS should have bought. Between the Z-181 display and the almost-ready flat-tension mask technology for monitors (and eventually TVs), Zenith is making a name for itself in display technology.—Bill Howard

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## ■ NEW PORTABLES

■ In place of a mechanical disk drive, HP included an electronic disk drive, known as the E-disc.

reveals the yellow LCD screen and a keyboard that is best described as, well, different. Its layout deviates from the standard too much to rate it highly. Only eight function keys grace the top row, there are no PgUp, PgDn, End, or Home keys, and the cursor keys are all on a single row, making them hard to use. Its typing feel is simply not acceptable, with a very short travel on the keys. It gives a toylike impression—too many compromises here.

**SCREEN SHOT** The screen will hold in virtually any position as you pivot it back, providing a wide range of viewing angles, once you get tired of looking for the on/off switch: the Portable Plus powers on by simply tapping the Spacebar.

HP calls its display an "enhanced LCD," and it is certainly an improvement over earlier HP portable displays. The yellow background with dark-blue letters makes it look like it's backlit, though it is not. Instead, HP is using a new material in

## TRAVELING LIGHT

*Diskless notebook-style portables may be more your style if your on-the-go computing is limited to small word processing and spreadsheet tasks.*

If you want to own a computer that travels very well, but you don't require the power-packed plasma displays and the hard disks that some of the top-of-the-line laptops offer, you may want to investigate the several "notebook-

style" portables still on the market today. Considerably less expensive than the laptops, they are adequate for small-scale word processing and spreadsheet use, but their memory limitations may hinder large-scale data manipulation.



### FACT FILE

#### Tandy 102

**Radio Shack**  
(A division of Tandy Corp.)  
1800 One Tandy Center  
Fort Worth, TX 76102  
(817) 390-2197  
List Price: \$499, including 24K RAM and internal 300-bps modem.  
Dimensions (HWD): 1.5×8.5×11.9 in.  
Weight: 3 lbs.

CIRCLE #71 ON READER SERVICE CARD

#### Tandy 200

**Radio Shack**  
(A division of Tandy Corp.)  
1800 One Tandy Center  
Fort Worth, TX 76102  
(817) 390-2197  
List Price: \$799, including LCD display, 24K RAM, and internal 300-bps modem.  
Dimensions (HWD): 2.2×8.5×11.75 in.  
Weight: 4.5 lbs.

CIRCLE #70 ON READER SERVICE CARD

#### NEC Starlet

**NEC Home Electronics (U.S.A.) Inc.**  
1255 Michael Dr.  
Wood Dale, IL 60191  
(800) 447-4700  
(312) 860-9500  
List Price: \$999, including 32K RAM and internal 300-bps modem.  
Dimensions (HWD): 2.12×11.75×8.5 in.  
Weight: 4.7 lbs.

CIRCLE #69 ON READER SERVICE CARD

#### NEC 8500

**NEC Home Electronics (U.S.A.) Inc.**  
1255 Michael Dr.  
Wood Dale, IL 60191  
(800) 447-4700  
(312) 860-9500  
List Price: \$999, including LCD display, 64K RAM, and internal 300-bps modem.  
Dimensions (HWD): 2.25×12×8.5 in.  
Weight: 6 lbs.

CIRCLE #68 ON READER SERVICE CARD

the display that increases the legibility considerably. Contrast can be adjusted by pressing a dedicated key either alone (to darken the display) or with the Shift key (to lighten it). Overall, the display falls somewhere between the beautiful Zenith screen and the Toshiba T1100 Plus, but much, much closer to the latter than the former.

The machine also has some other strange characteristics. Although it has an RS-232 port, the Portable Plus comes with the HP-II, a proprietary interface link for connecting HP peripherals. Special inter-

face cards are needed to hook up to non-HP equipment requiring a parallel interface, which either reduces the utility of the computer or increases the price, depending on your viewpoint.

**GOOD TOUCHES** Despite its anomalies, the Portable Plus has some nice touches. First, it comes with PAM, which is HP's DOS shell. Although I don't care much for DOS shells personally, PAM is a convenience for users who don't want to deal with DOS, and it is consistent with



### FACT FILE

#### HP Portable Plus

Hewlett-Packard Co.  
1000 NE Circle Blvd.  
Corvallis, OR 97330  
(800) FOR-HPPC  
List Price: With 256K RAM, \$2,695; with 512K RAM, \$2,995; external 3½-inch floppy disk drive, \$795; internal modem (300/1,200 bps), \$495.

In Short: The HP Portable Plus, which comes without disk drives, is more of a notebook machine than a portable PC. Its display is quite good, but compromises, especially in the keyboard, detract from its overall performance.

CIRCLE #72 ON READER SERVICE CARD

# "Blessed are the Pessimists; for they hath made backups."

— Exasperated 1:16

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## ■ NEW PORTABLES



The Hewlett-Packard HP Portable Plus has an electronic, internal disk drive, instead of the usual external ones. It performed relatively fast in the benchmark test, but its deviations from standard portables position it clumsily between notebook computers and true laptop PCs.

HP's larger, desktop machines. Second, the combination of a CMOS version of the 8086 running at 5.33 MHz and the ROM-based software makes the Portable Plus a pretty good performer. Two software "drawers" on the underside of the machine can take up to 1.28 megabytes of RAM or 24 (128K-byte) plug-in ROM chips. The E-disc and the main memory share the RAM, and the proportion allocated to either can be easily varied through a setup utility.

The Portable Plus comes only with MS-DOS 2.1, PAM, diagnostics, and HP Link (to share data with PCs). A number of popular packages are available from HP in ROM versions. Most notably, 1-2-3, Microsoft Word, MultiMate, and Symphony are available in ROM, and disk-based software can be downloaded to the E-disc by using the external disk drive.

**SUMMING IT UP** For some users, the HP Portable Plus might make sense: it has excellent battery life (around 20 hours), and it's small, relatively fast, highly engineered, and backed by a company with a good track record.

On the other hand, the Portable Plus isn't cheap, and many users will find its keyboard too distracting and the lack of a built-in disk drive a drawback rather than a benefit. If I were to use a diskless machine, I would still opt for a notebook machine like the Tandy or the NEC.—**Jon Pepper**

### COUNTER POINTS

- HP Portable Plus: underpowered and overweight. —**William G. Wong**
- The Portable Plus is a nice idea—a diskless DOS machine—that's grown older without getting much better, smaller, or lighter. —**Bill Howard**
- Landfill.—**Paul Somerson**

## Data General One/ Model 2

Being first is not always best. After all, if the Vikings were the first to discover America, why do we honor Columbus with a parade? Data General Corp. was truly the first company to market a DOS portable: the Data General One, an exciting machine when it came out. But its problems dampened the enthusiasm of users, and soon the market caught up to and then surpassed Data General.

To its credit, Data General is fighting back with two enhanced versions of the earlier portable. The new machine is called the Data General One/Model 2, and it's available with either an enhanced LCD or an EL display. Both displays improve significantly on the original LCD. In addition, it offers a hard disk machine, which we were unable to test for this review.

**GIANT STEPS** The enhanced LCD has now forsaken the ubiquitous gray display for blue letters on a green background. While I can't really say much for the color combination, the display is legible and quite large: 8½ by 6½ inches. The Model 2 (like the earlier version) has a true 2-to-1 aspect ratio, meaning that circles on the screen look like circles, not squashed plums. The display angle of the LCD pivots completely back down to flat, so the odds are good that you can find a comfortable viewing angle.

The large display is a definite plus for the Data General, as the screen makes the Toshiba TI-100 Plus and the HP Portable screen look like midgets by comparison. I would have preferred a bit more contrast, but the improvement over the earlier LCD is vast.

The EL display is a real winner, with amber letters on a fairly dark background. Although a bit smaller than the LCD version (it's 4½ by 7½ inches), the EL display is still larger than anything we tested with the exception of the Toshiba T3100. You can't tilt the EL display back past vertical, but this isn't a problem since viewing angle isn't really critical with EL displays.

In terms of overall legibility, the Data General display comes out ahead of anything save the GRIDCase 3 Plus plasma display, or the Zenith 181's, which have much more contrast. Some users might prefer the larger size of the Data General screen and its true aspect ratio to the GRID's 1.4-to-1 aspect ratio. In an effort to save power, the EL screen will blank after a few minutes without any keyboard entry. Tapping any key will bring it back to life.

**FULLY EQUIPPED** The Model 2 is a well-made, well-designed machine, with a few notable exceptions. There's room on the side for one or two 3½-inch floppy disk drives, or one floppy disk drive and a single 10-megabyte hard drive. A panel in the rear of the machine slides down to become a stand and reveals the I/O connectors.

While the basic system (Model 2-LCD) lists for only \$1,795, the price is a bit deceiving. You have to add on another \$200 to that price to get the serial/parallel ports and battery and charger. Still, if you need only a single floppy disk drive and 256K

## ■ NEW PORTABLES

The Data General One/Model 2 is available with either an electroluminescent screen (below left) or an LCD display. Both improve upon the original screen, and the EL is one of the best. Its slow performance and marginal keyboard, however, keep it trailing behind the other portables.



### PC FACT FILE

#### Data General One/Model 2

Data General Corp.  
4400 Computer Dr.  
Westboro, MA 01580  
(617) 366-8911

**List Price:** With LCD display, 256K RAM, and one 3½-inch floppy disk drive, \$1,795; with I/O ports, battery and adapter, \$1,995; EL screen, \$1,000; second floppy disk drive, \$210; 300/1,200-bps modem, \$450; 256K RAM card, \$390; 128K RAM card, \$250; second serial port, \$195; color adapter card, \$325; 10-Mbyte internal Winchester hard disk, \$1,000.

**In Short:** A much-improved version of the Data General One/Model 1, with two screen options that are both very good. But keyboard and speed problems keep this otherwise well-made machine from being at the top of the heap.

CIRCLE 874 ON READER CARD

bytes of RAM, the price is reasonable.

The units reviewed had an RS-232/422 port, modem, 512K bytes of RAM, and a second floppy disk drive. A configuration like that will set you back \$2,835 for the LCD and \$3,835 for the EL version. If you bump the memory up to 640K, the prices rise to \$3,085 and \$4,085, respectively. By way of comparison, the Toshiba T1100 Plus with 640K and the modem lists for \$2,798.

The connections are clearly marked on the Model 2, and there are two slots for installation options, including a second serial port, memory, modem, and expansion bus. The Model 2 also has the capability to connect up to Data General's CEO Connection, which no doubt makes it attractive for corporations that have invested heavily in Data General equipment.

**PERFORMANCE LAG** That's the good news about the Model 2. Here's the bad news. First, the keyboard is still not quite up to snuff. Although the actual feel of the Data General's keyboard is pretty good, the keys are a bit small and tightly spaced, and I found myself hitting wrong letters a bit too frequently at first. After a few days of getting acquainted with the keyboard, my typing speed got back up to normal, although I was still conscious of the tight key spacing and was never quite comfortable.

A much less forgivable problem is the cursor-key arrangement, which puts the four keys on a single row at the bottom right of the keyboard. Despite practice, I couldn't get used to this approach; it simply is not natural or logical and leads to numerous errors when trying to position the cursor. The single-row approach is a really poor substitute for either the diamond or the T configuration.

The other real drawback is performance. While the machine has absolutely no trouble running any of the software that ran on the other test machines (*Javelin*, *I-2-3*, *Framework*, and *WordPerfect*, for example), it checked in with the slowest CPU speed and drive performance. I'm willing to make compromises for using a portable, but slow disk speed and a slow CPU are just a bit too much.

**THE BOTTOM LINE** This leaves the Data General One/Model 2 certainly much better off than the original Data General

### COUNTER POINTS

• DG's second-generation machines are no match for the Z-181 or the T1100 Plus. Maybe DG's third try will be a charm?—William G. Wong

• When my fingers get 20 percent smaller I'll start using a keyboard that's 20 percent smaller.—Bill Machrone

• Now the screen is fixed, what about the keyboard? The whole package is too heavy and bulky—the AC adapter looks like a PlaySkool tape recorder, with no sharp edges. A soulless new machine.—Bill Howard

• Strike two (actually a long foul ball). One more and they're out.

—Paul Somerson

## ■ NEW PORTABLES

One but still with a bit of distance to cover. There's really no faulting the display, the construction, or the support you'll get from Data General. In fact, it's ironic that the Data General displays, once the worst, are now almost the best. And Data General offers several repair/replacement/support programs that could prove to be very important considerations to potential buyers. These services include on-line information support and a same-day loaner service called Executive One.

But the cursor arrangement is really a problem for serious word processing, and the performance might also be a problem for some users. If Data General came up with a new keyboard and a faster CPU without increasing the price, the machine would be much more competitive with the other portables on the market.

### GriDCase 3 Plus

Grid Systems Corp. has always produced computers that were exceptional, striking, desirable, and a bit expensive. The new GriDCase 3 Plus continues that tradition, while refining and improving almost every aspect of the previous models that could be improved.

While some products might work their way into your favor fairly slowly, the GriDCase 3 Plus evokes an immediate, and very strong, reaction: you want one. Where other manufacturers liberally apply plastic to house their products, the GriDCase 3 Plus is encased in a matte-black space-age case made of magnesium; it's extremely durable, strong, and lightweight. In fact, everything about the GriDCase 3 Plus conveys thoughtful engineering and innovative design; it simply looks and feels different from any other portable (or any other desktop).

**NEW TOUCHES** The GriDCase 3 Plus is basically the GriDCase with several nice new features, most notably an enhanced keyboard, more ROM (up to 1 megabyte), and the option of an internal 10-megabyte hard drive. It's available in two models that differ only in their displays: the GriDCase 2 Plus has a yellow LCD, and the GriDCase 3 Plus has a gas-plasma display.

My only serious complaint about the



### Benchmark Tests: IBM PC-XT vs. Portable Computers

The clear winner in all of the benchmark tests is the Toshiba T3100, simply because of its 80286 microprocessor. This laptop, however, has a significantly higher price tag than the others. Of the remaining laptops, the fastest is the Toshiba T1100 Plus, which uses an 80C86 microprocessor running at 7.16 MHz. It is from 32 percent to 66 percent faster than laptops using the 80C88, such as the Data General One/Model 2 and the Zenith Z-181 Portable PC.

#### Performance Times

(Times given in seconds and decimal seconds)

Product	NOP	Floating-Point Calculation	1-2-3 Routine	Disk Access
IBM PC-XT	10.11	155.24	54.00	106.91
Data General One Model 2	12.49	190.02	60.00	N/A
Zenith Z-181 Portable PC	10.58	160.99	56.20	N/A
GriDCase 3 Plus	7.31	114.96	48.00	116.27
HP Portable Plus	6.26	92.86	38.00	N/A
Toshiba T1100 Plus	5.05	77.01	35.00	N/A
Toshiba T3100	4.17	34.68	22.00	153.00

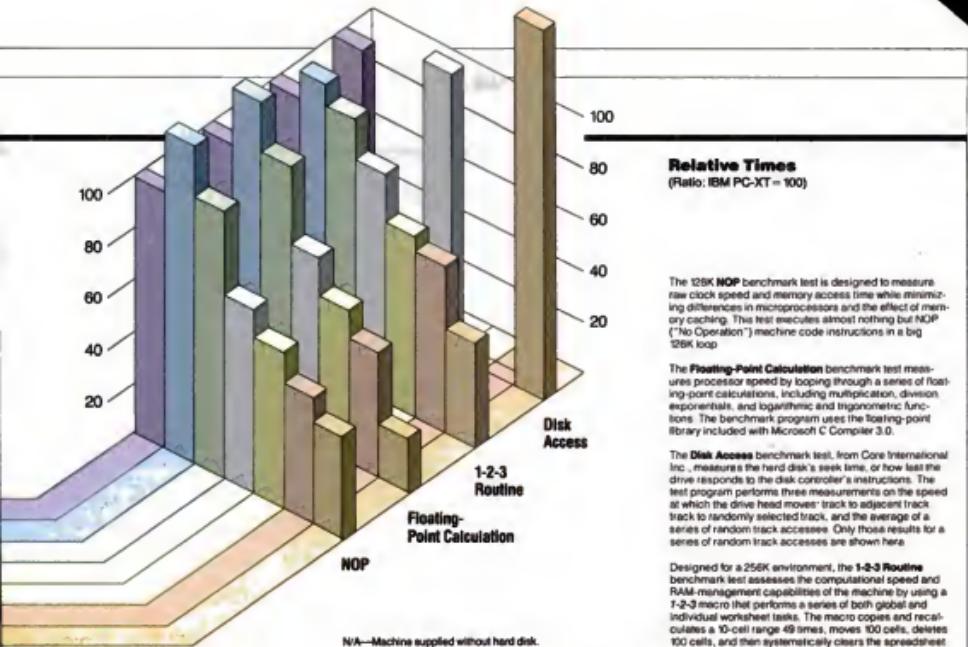
earlier model, the GriDCase, was that it lacked dedicated function keys. You had to hit a special code key plus another key to generate the F1 to F10 keys, which tended to pretty much obviate the advantage of having function keys in the first place. The GriDCase 3 Plus' redesigned keyboard has the function keys along the top row, including F11 and F12 (which double with

Ins and Del). An imbedded numeric keypad was also added.

The GriDCase 3 Plus keyboard could serve as a standard for how good portable keyboards can be. It has the quietest, most silky-smooth touch of any keyboard I have ever worked on, with good tactile feedback and a minimal key-click sound. The keyboard is compact—only 71 keys—but



*The GriDCase 3 Plus looks and feels different from all its competitors. Clad in a magnesium case, its construction is high quality both inside and out. The keyboard is compact yet smooth, and the plasma display is vibrant.*



it can generate all the IBM keys. Keys that double are logically arranged by mnemonics where appropriate. For example, NumLock doubles on the N, and ScrollLock on the S.

**A DIFFERENT APPROACH** Grid Systems has never been afraid to buck conventional wisdom. The way its designers thought through the addition of the 10-megabyte drive on the GridCase 3 Plus is a case in point. In an effort to keep the weight of the machine down—it weighs less than 12 pounds—the company offers the GridCase 3 Plus with either an internal 3½-inch drive or the 10-megabyte hard drive. Admittedly this seems like a drawback at first, but when you think about it, it makes sense.

Grid Systems reasoned that users don't always need to use floppy disks in the field; so it designed a machine that didn't force users to take them along. If you opt for the hard disk drive and need a floppy disk drive in the office or in the field, you can purchase the new Grid Pocket Floppy (\$295), a 1½-pound floppy drive that almost can fit in your pocket. It cables onto a connector on the side of the Plus and draws

power directly from the machine—a rather ingenious solution.

The GridCase 3 Plus can also take up to 1 megabyte of ROM into an area under a



## FACT FILE

**GRIDCASE 3 PLUS**  
Grid Systems Corp.  
2535 Garcia Ave.  
Mountain View, CA 94043  
(415) 961-4800

**List Price:** GridCase 3 Plus with gas display, \$3,280; GridCase 2 Plus with yellow LCD, 128K RAM, parallel/serial port, internal 3½-inch floppy disk drive, \$2,750; external 5¼-inch floppy drive, \$875; 3½-inch pocket floppy disk drive, \$295; RGB connector, \$295; expansion bus, \$325; internal 300V, 200-bps modem, \$495; 8087 processor, \$195; 384K RAM, \$400; 512K RAM, \$600; battery, \$60; internal 10-Mbyte hard disk, \$975.

**In Short:** A unique, highly designed machine that is constructed to the highest standards with the best materials. Incredibly rugged and well made, with many innovative design ideas.

CIRCLE 675 ON READER SERVICE CARD

The 128K NOP benchmark test is designed to measure raw clock speed and memory access time while minimizing differences in microprocessors and the effect of memory timing. This test executes almost nothing but NOP ("No Operation") machine code instructions in a big 128K loop.

The Floating-Point Calculation benchmark test measures processor speed by looping through a series of floating-point calculations, including multiplication, division, exponentials, and logarithms and trigonometric functions. The benchmark program uses the floating-point library included with Microsoft C Compiler 3.0.

The Disk Access benchmark test, from Core International Inc., measures the hard disk's seek time, or how fast the drive responds to the disk controller's instructions. The test program performs three measurements on the speed at which the drive head moves' track to adjacent track, track to randomly selected track, and the average of a series of random track accesses. Only those results for a series of random track accesses are shown here.

Designed for a 256K environment, the 1-2-3 Routine benchmark test assesses the computational speed and RAM-management capabilities of the machine by using a 1-2-3 macro that performs a series of both global and individual worksheet tasks. The macro copies and recalculates a 10-cell range 49 times, moves 100 cells, deletes 100 cells, and then systematically clears the spreadsheet

small cover strip at the top of the keyboard. You can purchase ROM software from Grid Systems, or the company will burn your own software (with proof of purchase) into ROM for a price.

**EASILY THE BEST** The Grid Systems displays have never had an equal, and they still don't. The plasma screen on the GridCase 3 Plus is awesome, with orange letters on a true-black background that provides a measure of contrast that other plasma displays can't touch. And the Grid plasma display is the only one that has a brightness control.

For \$530 less, you can buy the GridCase 2 Plus, which is the same machine with the world's best LCD display. The yellow LCD has a 7-to-1 contrast ratio, and it doesn't have any competition among LCDs.

For some users, the most appealing aspect of the GridCase 3 Plus is not just the hard disk or the killer displays but the fact that it's the only portable with a hard disk and/or a plasma display that will run on batteries, and this is an advantage to remember. Of course, the plasma display with the hard disk drive won't run for a

## ■ NEW PORTABLES

long time on batteries (about an hour or so), but you can get optional battery packs (at \$60 each) to increase its field-use potential.

**ROCK SOLID** The GRiDCase 3 Plus, with its CMOS 8086 processor, ran through all my software admirably. The only real problem is the slow disk-access speed—a problem with all portables.

Its performance ranked after the two Toshibus, which is not surprising since the T3100 is a 286 machine and the T1100 Plus has a high-speed clock. You can add an optional 8087 to the machine to speed

### COUNTER POINTS

- The screen and hard disk are the GRiDCase 3's redeeming features, but it's still a bit overpriced.

—William G. Wong

- The Most Improved award goes to the GRiDCase 3 Plus. The keyboard is tons better than it used to be, but it's still not perfect for a DOS-oriented world. I question Grid's replacement of the floppy disk with a hard disk, although the floppy sure is small. Couldn't the company have found a way to fit both? —Bill Machrone

- If you wear Porsche Design sunglasses, read the Sharper Image catalog cover to cover, and wouldn't dream of missing "Miami Vice," there's no other choice. The black metal case is so high-tech, the keyboard is improved over earlier GRiDs, and the plasma display is better than the Toshiba T3100 (orange on black, not orange on dim orange). But mostly the Grid represents a costly and heavy triumph of form over substance—except to brain-dead yuppies.—Bill Howard

- The earlier keyboard was a big practical joke; at least these guys are moving in the right direction. This isn't a laptop, though; it's a high-tech movie prop, the kind of glitzy toy that gets written up in fashion magazines. Its lush and weapon-like styling make it the perfect status accessory on a stark, empty desk in some California airhead executive's office. It's the Uzi of portables.—Paul Somerson

## CONFUSION LINGERS IN THE AIR

*Some airlines allow you to use your laptop in-flight, some don't, and some aren't sure. What exactly are the rules?*

If you plan on using a laptop on your next domestic or international flight, it might be wise to call the airline beforehand to question its policy on computer use during flight. If the airline tells you that passengers may not use computers onboard, bring it anyway. Or if they say only those devices with liquid crystal displays are permitted, don't hesitate to bring your plasma display.

Totally confused? So are the airlines.

Despite assurances from the Federal Aviation Administration that using any laptop computer on a plane is perfectly safe, some airlines are choosing to ban laptops, claiming that they could interfere with navigation and communications equipment. But according to John Leyden, spokesman for the FAA, independent studies plus tests conducted by the FAA in 1984 found that computer use does not interfere with airline equipment.

**EXTINGUISH ALL LCDs** According to Bill Jacklin of the Air Transport Association (ATA), all major U.S. carriers are asked to follow the same policy on computer use. Put simply, this policy states that computers may be used during all phases of a flight, except during takeoff and landing, when all carry-on baggage must be placed securely under the seats or in the overhead bins.

However, Jacklin notes, the crew on the individual flight has the final say. Any crew member who thinks the plasma display on your computer is interfering with navigation or communications equipment can ask you to turn it off. In

up certain applications somewhat.

It's apparent from looking at and working with the GRiDCase 3 Plus that all the fittings, tolerances, and construction standards are first-rate. In fact, the machine is so solid (without being heavy) that it gives the impression it will last forever. It might

another scenario, the captain may give you permission to use an LCD device, while the flight attendant, unaware of the policy, may ask you to refrain from using it. Jacklin adds that situations like these rarely occur.

Part of the confusion may stem from the fact that computers were once banned from all airlines. Portable computers were an oddity, and at that time they had not been tested for meeting safety requirements. It was not until 1984, when the FAA reported that computers were safe, that airlines began to permit them. "For a long time we didn't allow them on board," Bill Hastings of Pacific Southwest Airlines says. "But recently we reviewed the studies done by the FAA and decided PCs didn't interfere with navigation equipment."

**FOLLOW THE RULES** If you're going to be traveling with one of the major U.S. airlines, it's almost certain that you will not have any problems, provided that you follow the rules. According to FAA regulations, all airlines forbid computer use during takeoff and landing, and all ban electrical equipment that uses radio transmissions. Aside from these restrictions, most domestic airlines, including American, United, TWA, Delta, Pan Am, and Eastern, allow passengers to use computers.

While a spokesperson for People Express insists that passengers on that company's planes are allowed to use computers, several People Express customer-service representatives and reservation

The GRiDCase 3 Plus is expensive, but it's worth it. The GRiDCase 2 Plus, with the LCD display, an internal floppy disk drive, and 128K bytes of RAM is \$2,750; the GRiDCase 3 Plus in the same configuration is \$3,280. The internal hard drive adds \$975 to the price tag, and bumping

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KLM Royal Dutch Airlines are restricting certain types of computers, particularly those with plasma displays. At its Tokyo headquarters, JAL is investigating the LCD screens for possible approval, but the airline will not consider even testing plasma displays or screens with bright red displays.

Airlines that ban plasma displays are concerned that the more power-hungry plasma screen will act as an antenna and interfere with equipment. But Ed Murphy of Grid Systems Corp., maker of several laptops with plasma displays, says that although the plasma display requires more power than an LCD requires, the power comes from a battery, and so it should not cause any interference.

"I have used a gas plasma display on many airlines, and I never had a flight attendant say, 'Turn that thing off.' We don't know which runway to land on."

Until the portable computer becomes as familiar as the calculator, inconsistent responses from the airlines and their personnel will more than likely continue. Once you do get the computer onboard, you may be asked by a flight attendant not to use it, only to hear the captain announce on the intercom minutes later: "The person with the computer has our permission to use it."

Or, as happened to a Toshiba employee who brought the 1100 on board, the captain may take your computer into the cockpit to "test" it and then play with it during the flight, only to return it to you after the plane has landed.

—Peggy Gavan

table reviews (see "DOS to Travel," *PC Magazine*, Volume 5 Number 13), executive editor Paul Somerson said that if the GridCase 3 had dedicated function keys, an internal hard disk, and a lower price tag, dealers wouldn't be able to keep it on the shelves. Grid Systems has managed to

supply two out of three of Somerson's demands, and the odds are good that the GridCase Plus models won't stay on the shelves for long. If you're looking for the best, start to finish, look no further than the new GridCase 3 Plus.—Jon Pepper

## Toshiba T3100

The Toshiba T3100 is a step up, the beginning of a new generation and a new class of machine. It's truly an AT-class portable, with a bright, full-size plasma display, a nice keyboard, and both an internal 10-Mbyte hard disk and a 3½-floppy disk drive.

While Compaq may have beaten Toshiba to market with its 286-based Portable II, there's no contest between the two machines. The Toshiba is a well-balanced, trim 15-pound computer that is well worth carrying around, whereas the Compaq is burdened with a so-so screen and keyboard. I wouldn't take a 26-pound Portable II anywhere without a porter.

**HIGH STYLE** If you're attracted to high style, you'll find the T3100 enticing. The deep-gray case, with louvred air slots for the plasma display, and the T3100 logo in burnt orange, looks good even before it



## FACT FILE

### Toshiba T3100

Toshiba America Inc.  
Information Systems Division  
2441 Michelle Dr.  
Tustin, CA 92680  
(714) 730-5000

**List Price:** With 640K RAM, 10-Mbyte hard disk, 3½-inch floppy disk drive, parallel/serial and RGB ports, clock/calendar, and case, \$4,499; internal 300V/200-bps modem, \$399; external 5½-inch floppy drive, \$499; PC Floppy Link, \$199; expansion chassis and cable with five slots, \$999; expansion interface card, \$199; 2-Mbyte memory expansion card, price to be determined; numeric keypad, \$99.

**Requires:** AC outlet.

**In Short:** Simply the best AT-compatible portable on the market today. It may be a bit pricey, but in this case you are certainly getting what you pay for.

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It sounds great; the idea of a speedup board that you can just plug right in as easily as putting bread in a toaster. How wonderful to be able to convert a PC or XT to a \$4000 AT without the expense. But even when you get ready to spend \$395.00 you want to be sure your choice is the very best.

Here at PCSG we sell our IBM PC disk access speedup software by the thousands. But software doesn't do anything about speeding up the microprocessor (or CPU) speed. As you know the microprocessor is the brain of the computer that controls all the operations like screen updates and calculations like a spreadsheet makes.

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*Faster and smarter than an AT—  
PCSG guarantees it.*

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We wanted to offer a speedup card that would be the compliment to our disk speedup software, (incidentally included at no extra charge.) We wanted it to be literally the most advanced, fastest, most feature rich board available today. We could only be satisfied with a board that was the finest example of the engineering art.

There is no question we have met our every objective by developing and manufacturing the *BREAKTHRU 286* card. This is the best designed and most functional speed up card available today. We guarantee it.

**HERE IS WHAT MAKES IT SO SPECIAL.**

First, it installs so easily. It is a half slot card, only five inches in length. You don't even have to give up a full slot. What's more, unlike competing products it works in the Compaq and most clones. The instructions are so simple we considered showing a picture of a child putting it in. Easy diagrams show how you just place the card in an open slot, remove the original processor and connect a single cable. There is no software required. From that moment you are running faster than an AT.

Second, it is advanced. The *BREAKTHRU 286* replaces the CPU of the PC or XT with an 80286 microprocessor that

is faster than the one found in the AT. It provides zero-wait-access to the most important data. In benchmark tests the card averages programs—both custom and off-the-shelf—200% to as much as 700%. Wow!

Third, you have full compatibility. RAM, hardware, and peripheral cards can be used with software modification. It operates with L-computer communication products and conforms to Microsoft Expanded Memory Specification compatibility is virtually universal.

Fourth, it is the best there is. There are many boards on the market. Some are priced above the *BREAKTHRU 286* and some are cheaper. We compared them all, but there simply was no comparison. What we discovered is that many cards bear a marginal speed up in spite of their claims, to be merely versions of the obsolete 8088 or to be just poorly engineered. The 8MHz *BREAKTHRU* unequivocally the best executed and most cost effective speedup board manufactured today.

PCSG has since early 1983 dominated the largest market with ROM software such as Lucid SpeedWrite ROM that reviewers rated as excellent. We were the first to successfully enter the IBM PC market last year with our *BREAKTHRU* speedup card. We use them on our PCs to make them faster than AT's. We are really excited about this product.

PCSG makes the unabashed statement that the *BREAKTHRU 286* card represents more advanced technology than the *BREAKTHRU 286* card. We sell the *BREAKTHRU 286* card at \$395. Call today with your MasterCard, American Express or COD instructions and we will ship the very next day.

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## ■ NEW PORTABLES



The sleek Toshiba T3100 is a speedy big brother to the T1100 Plus, whose excellent keyboard design it shares. At \$4,500, this 286-based machine gives AT performance (except for its painfully slow, hard disk access) and is as powerful as any portable computer can be—provided, of course, you find a place to plug it in.

goes to work for you. Touching a front-mounted latch pops the hinged display open. Adjustment is infinite back to about 30° beyond vertical, though the viewing angle isn't especially critical with a bright plasma display.

The trunk of the display has seven small indicator lights for power/speed, disk in use (left for the hard disk drive and right for the floppy disk drive), external monitor, and the keyboard-locking keys.

Except for the changed color scheme, the keyboard is identical to that of the Toshiba T1100 Plus. Like the T1100 Plus, the T3100 has a very good typing feel, raised locator dots on the F and J keys, and oversized keycaps for Enter, Backspace, and Shift. And, also like the T1100, the T3100 uses Ctrl-Alt (or Ctrl-Shift) combinations to toggle processor speeds (8 or 4 MHz) and displays (external monitor or plasma) and to generate the codes for the IBM large, gray Plus and Minus keys. While it is understandable that the Toshiba designers had to decide to leave out something to keep the keyboard compact, using the three-key combination is a bit inconvenient with certain software (*Word Perfect*, for example, where the gray Plus and Minus keys scroll up or down by screen view).

**ALL GASSED UP** An area where the T3100 had few equals among the machines tested was the gas-plasma display, which measures just a bit shy of 8 inches by 6 inches. Plasma technology is so good you tend to get a bit mesmerized and wonder why anyone would use an LCD. The bright orange letters on the dark orange background are eminently readable under any lighting conditions, including no light at all. The T3100's screen appears to be the same plasma screen used by the Panasonic Executive Partner and the gone-but-not-forgotten Ericsson Portable.

However, despite the superiority of the plasma display, some manufacturers opt for LCDs for a compelling reason: power consumption. Between the power-hungry display and the internal hard disk, the T3100 needs a lot of juice, and regrettably, you can't operate it on batteries.

**WELL CONNECTED** The T3100 has a carrying handle that pulls out from the rear of the machine. It's a convenient way to tote the computer, although for longer trips you'd probably prefer the padded carrying case (included in the base price). The handle also pivots under the computer to double as a stand, and it covers and protects the rear panel connectors when not in use.

A parallel and AT-style (nine-pin) serial port, RGB connector, voltage selection (115 or 230), and on/off switch are all located in the rear of the machine. A group of six DIP switches controls a number of configuration options, including the display font (either standard English or Northern European), memory size, display (external CRT or plasma), and whether the machine recognizes the COM port as COM1 or COM2.

Located on the side of the Toshiba is a three-position switch labeled A B PRT, which controls the assignment of the parallel port. The optional external 5½-inch drive connects to the parallel port, and the A B PRT switch determines whether the external drive is identified as A or B, or whether the printer is selected.

**TOP SPEED** As might be expected, the 286-based T3100's performance pretty much blew the socks off the other portables, although it wasn't really a fair fight. The benchmark test results for any CPU-intensive applications were virtually identical to those of 8-MHz desktop machines.

### COUNTER POINTS

• Carrying the Toshiba T3100 beats lugging around a Compaq portable, but the orange-on-orange display doesn't provide enough screen contrast.

—William G. Wong

• It's not a Compaq II replacement until Toshiba improves the hard disk speed and the screen's graphics compatibility.—Bill Machrone

• Too many PCs and too many programs are marginal advances on the state of the art. Not the T3100. Toshiba plugged nearly every important feature of the Compaq Portable 286 into a box one-third Compaq's size. While it could use a bigger, faster hard disk and an EGA (not CGA) output for an external monitor, it's sensational already.

—Bill Howard

• The only lap this will fit on is Kareem Abdul Jabbar's. Decently engineered, and not bad to look at, but the crawlily slow hard disk will make you yearn for floppies.

—Paul Somerson

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## ■ NEW PORTABLES

■ As might be expected, the 286-based T3100's performance pretty much blew the socks off the other portables, although it wasn't really a fair fight.

meaning that the Toshiba has plenty of power. For more disk-intensive applications, the Toshiba loses out mightily compared to your average AT hard drive. You'll have plenty of time to ponder the meaning of life while waiting for the hard drive to do its stuff. The T3100's overall performance, however, is simply excellent, and *Crosstalk*, *Javelin*, *Microsoft Word*, and *I-2-3* look just as at home on the T3100 as they do on an AT.

So, on balance, the T3100 gets superb marks. It isn't perfect, but it points the way toward the next generation of AT-class portables. If you need more power, a 2-megabyte memory card will piggyback onto the motherboard without using up a single expansion slot. You can also get an expansion unit that will accommodate five AT-style cards.

Toshiba has done an excellent job in bringing out two portable computers that are at or near the top of the heap. The big consideration with the T3100 might be the cost. It obviously costs some money to put so much into such a small package, and at \$4,500 the T3100 is a very pricey item. If all you're looking for is any old portable computer, you'd better not look at the Toshiba T3100 because you'll want to buy it, no matter what the price is. But if you need more—a powerful computer with a small footprint, AT performance, good looks, and easy portability—the T3100 is just the ticket.—**Jon Pepper**

*Jon Pepper is a frequent contributor to PC Magazine.*

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# DOS-to-Travel Updates

## ON THE ROAD AGAIN

In July 1986 *PC Magazine* published "DOS to Travel" (*PC Magazine*, Volume 5 Number 13), claiming that portable computers were new all over again. Portables had evolved a complete generation; no longer was the lightweight, notebook-style Tandy 100 the most practical machine to take on the road. IBM had entered the fray with the PC Convertible. Compaq offered a portable that was smaller and lighter, and half-a-dozen other manufacturers offered DOS machines that came closer in performance to their desktop counterparts than ever before.

The results of the reviews of the new portables, however, were disappointing. Portability still meant compromise. None of these machines, the reviewers concluded, were ready for prime time.

Six months later, portable computing has evolved yet another generation. Several new machines are available—some with hard disks; one with an 80286—and a number of manufacturers have updated their original entrants with improved screens and/or keyboards. The results of *PC Magazine's* present evaluation are that DOS travels better now.

Many of the machines originally evaluated for "DOS to Travel" have remained essentially the same, though. So PC Labs did not test them for this roundup. For purposes of comparison, they are included in the features table and capsule summaries are printed here.

### Compaq Portable II

Compaq's entry in the portable market is the largest machine that was evaluated. It is also the fastest. The Compaq Portable II has the most storage capacity and a CRT screen. The most PC compatible of the portables, the Compaq Portable II has both

PC- and AT-compatible slots.

The AC-powered Compaq comes complete with 640K bytes of RAM, a 20-megabyte hard disk, and a single 5½-inch floppy disk drive. The screen is a standard monochrome monitor, and the keyboard is as AT-like as you will find in a portable.

The Compaq Portable II displays excellent compatibility, both in hardware additions and in software. Its hard disk unlocks the advantages of speed and the full capabilities of DOS. It also offers 80287 support, which could be important if you solve engineering problems or run complicated mathematics models in the field.

If you know how to use a PC, you'll be right at home with the Compaq Portable II, and that, after all, is the point. The drawback is its weight: at over 26 pounds with a hard disk, it's just too heavy.

### Quadram Datavue 25

The Datavue 25 offers several important options that most of its competitors do not, including a wireless keyboard, an internal 20-megabyte hard disk, and three different screen-lighting options.

You can configure your machine as you'd like, using one 5½-inch floppy disk drive, two 3½-inch micro floppy disk drives, or one 3½-inch floppy disk drive and one hard disk drive.

Screen options include standard LCD, backlit LCD, and high-quality gaslight display.

The remote keyboard is a big plus, and Quadram now includes a more substantial mechanical version as standard equipment with a hard disk Datavue 25 (it's optional if you choose floppy disk drives). Also available as a replacement keyboard is the KeyStyle 80, which sports its own flip-up LCD screen and internal software and

memory. It can function as a standalone notepad and transfer files.

The Datavue 25 is a powerful machine that eats battery power hungrily, but the optional battery pack available for the floppy disk drive models can be recharged while the Datavue is in use.

### IBM PC Convertible

The IBM PC Convertible tries to be both a laptop portable computer and a semi-desktop computer at the same time. Unfortunately, it doesn't shine at either task.

As a laptop portable, the machine does fairly well, giving you a good keyboard, a passable LCD display, and an idiot-proof DOS shell. But you have to give up a numeric keypad, half the cursor-control keypad, and the full-size function keys of a desktop PC.

The PC Convertible is one of the bigger laptops; when it's fully decked out, there is no way you could use it in the coach section of an airplane. Fortunately, one important improvement has been made: the PC Convertible can now be equipped with a Hayes-compatible internal modem.

IBM has taken a bold step with front-facing 3½-inch drives, and getting a laptop to run at the speed of a PC is a noteworthy achievement. The PC Convertible is not a technical tour de force, but it does give an aura of legitimacy to the MS-DOS laptop marketplace.

### Kaypro 2000

The sleek Kaypro 2000 is compromised by some serious design flaws that render it difficult to use. Most obvious is the on/off switch, which is connected to the case itself. When you flip the screen up, the machine turns on, and when you close it, the power is cut off. The on/off utility accessed by Crtl-Alt-S is not nearly as logical as a simple switch would be.

The keyboard has a sensible design, and, best of all, you can detach it from the case. You'll need to take advantage of this feature because the substandard LCD screen is not easily adjusted for contrast, and you may have to position yourself lower than the screen to see it well.

It's also unfortunate that the Kaypro 2000 comes with only one 720K-byte 3½-



**(1) Sharp PC-7000**

Sharp Electronics Corp.  
Sharp Plaza  
Mahwah, NJ 07430

**List Price:** \$1,795 for 384K (320K user-available) RAM, two 5½-inch floppy disk drives, MS-DOS 2.11; printer, \$399; RGB, \$255; modem, \$349.

**Requires:** AC outlet.

**In Short:** One of the best MS-DOS laptops on the market when PC Labs first looked at laptops, this compact computer needs to be plugged in to run but offers lots of standard features, high performance, and a readable display.

**CIRCLE 681 ON READER SERVICE CARD**

**(2) Zenith Z-171 PC**

Zenith Data Systems Corp.  
1000 Milwaukee Ave.  
Glenview, IL 60025  
(800) 842-9000

**List Price:** \$2,399

**In Short:** Selected by the IRS for its field agents to use, the Z-171 PC is a serviceable, compatible portable computer.

**CIRCLE 680 ON READER SERVICE CARD**

**(3) IBM PC Convertible**

IBM Corp.  
Entry Systems Division  
P.O. Box 1328  
Boca Raton, FL 33432  
(800) 447-4700

**List Price:** With 256K RAM, AC adapter, Application Selector, SysApps, \$1,995; DOS 3.2, \$95; 128K RAM upgrades (maximum, 2), \$195; 300/1,200-bps internal modem, \$450; serial/parallel module, \$295; printer cable, \$45; CRT adapter module, \$325; 9-inch composite monochrome monitor, \$400; 13-inch RGB monitor, \$400; 3½-inch external drive for PC-XT, or PC AT (separate models), \$395; 3½-inch internal drive for new PC XT, \$190; system hardware guide, \$50; technical manual, \$75; service manual, \$150; carrying cases, \$44 and \$54.

**In Short:** IBM's entrant is a bit heavy and bulky, considering that the basic box lacks serial, parallel, and video outputs. Good keyboard feel and layout, adequate LCD display. Pricey when configured with options.

**CIRCLE 678 ON READER SERVICE CARD**

**(4) Compaq Portable II**

Compaq Computer Corp.  
20555 FM 149  
Houston, TX 77070  
(713) 370-0670

**List Price:** Model 1 (one floppy disk drive), \$3,499; Model 2 (two floppy disk drives), \$3,599; Model 3 (one floppy disk drive and one 10-Mbyte hard disk), \$4,799.

**Requires:** AC outlet.

**In Short:** The most common solution to DOS-to-travel, it offers a high degree of compatibility, the greatest storage capacity, and the fastest operation of all the laptops in the first roundup of reviews.

**CIRCLE 679 ON READER SERVICE CARD**

**(5) Kaypro 2000**

Kaypro Corp.  
533 Stevens Ave.  
Solano Beach, CA 92075  
(800) 4-KAYPRO  
(619) 481-4300

**List Price:** \$1,995

**In Short:** The Kaypro 2000 is a basically good design that is flawed by some unfortunate compromises.

**CIRCLE 683 ON READER SERVICE CARD**

**(6) Quidram Datavue 25**

Quidram Corp.  
One Quad Way  
Norcross, GA 30093  
(404) 923-6666

**List Price:** With 256K RAM, LCD screen, \$1,695; with 768K RAM, backlit fluorescent screen, \$2,295; with 1.25 Mbytes RAM, gaslight screen, \$2,645.

**In Short:** A power-packed but still laptop-size portable with multiple screen, keyboard, and disk drive options, including a 20-Mbyte hard disk.

**CIRCLE 684 ON READER SERVICE CARD**

**(7) Panasonic Exec. Partner FT-70**

Panasonic Industrial Co.  
One Panasonic Way  
Seacaucus, NJ 07094  
(201) 348-7000

**List Price:** \$2,595

**Requires:** AC outlet.

**In Short:** Although the Exec. Partner is too bulky and heavy to be easily portable, features such as a truly legible screen and a dual-speed processor make it a worthwhile machine.

**CIRCLE 682 ON READER SERVICE CARD**



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## ■ NEW PORTABLES

inch disk drive. Kaypro supplies optional add-on drives, but the machine is supposed to be a true portable without add-ons. The 2000's designers are to be congratulated, however, for the positioning of the disk drive, which is protected from the elements when the case is closed.

### Panasonic Exec. Partner FT-70

The Panasonic Exec. Partner FT-70 is simply too big to be called a true laptop computer. At 30 pounds, you wouldn't want to carry it anywhere.

Nevertheless, Panasonic has designed a machine strong on basics. The Exec. Partner comes with two 5 1/4-inch floppy disk drives, a built-in thermal printer, and, most impressive, a high-resolution 11-inch plasma display and a dual-speed 8086-2 CPU.

The plasma display is beautiful and readable under any lighting conditions. It scrolls without a flicker.

The high-speed mode rates 1.7 on *The Norton Utilities*' SysInfo test and works with all the software we tried. It is easily accessible through the particularly firm and sturdy keyboard.

The floppy disk drives perform well, but their doors are sometimes difficult to close. Software compatibility is not a problem to worry about. Only the lack of memory in the standard 256K configuration will slow you down.

The printer is a mixed blessing. It's fairly good and useful, but you must transport the paper it uses separately, and the extra weight of the printer makes the Exec. Partner FT-70 that much heavier.

### Sharp PC-7000

For \$1,795, the Sharp PC-7000 offers two 5 1/4-inch disk drives, 384K bytes of memory, and one of the best LCD screens available on the market, making it a laptop to be reckoned with.

The PC-7000 sports a backlit LCD screen, on which you can choose from three levels of brightness and regular or inverse display. It also has a panel that tilts forward with just the touch of a button and a contrast adjustment switch. You can

really use this LCD screen anywhere! You can also change the screen element when it loses its brightness or you want to switch to green display.

The detachable keyboard, with its 13-inch cable, is one of the PC-7000's best features. It's close to being a full-size AT-style keyboard, but its touch is light.

Software compatibility is very good, and the extremely quiet floppy disk drives are as fast as (or slightly slower than) the standard PC drives. One new option: a 20-megabyte external hard disk that brackets onto the main unit.

### Zenith Z-171 PC

The Zenith Z-171 PC (previously called the Z-170 PC) is the weapon of choice for the Internal Revenue Service's field agents, and they have made a fairly good choice. It's a truly compatible, very serviceable machine.

The portable's lunch-pail shape makes it a bit too top heavy to be completely stable on your knees, but the Z-171 PC is relatively lightweight and will run for up to 3 hours on a single charge.

The Z-171's LCD screen is backlit to solve the problem of using it in a dimly lit area; the flip side, of course, is that it becomes difficult to see under bright lighting conditions. The keyboard's design isn't bad, except for the membrane-type function keys arrayed across the top.

The two 5 1/4-inch disk drives, located in the right side of the computer, are capable of reading anything you produce on your desktop PC. Except for standard laptop-type glitches, the Z-171 has no trouble running just about any software. It comes equipped with built-in applications that can replace SideKick or any other pop-up utility.—Don Willmott

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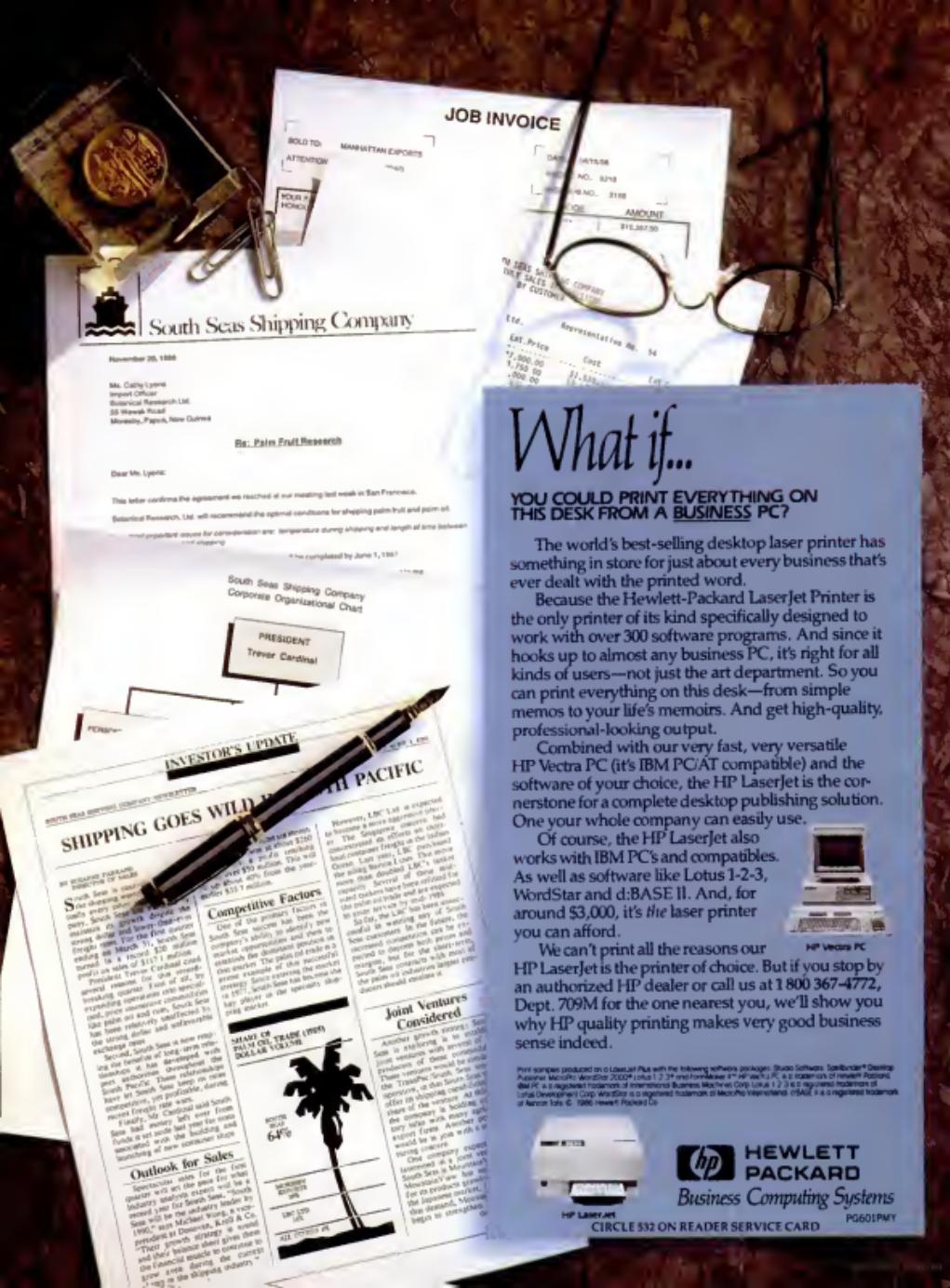


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# BREAKING THE TWO-PORT LIMIT

O

f all the design errors and omissions in the PC, probably the most shortsighted and difficult to remedy was limiting the serial communication ports to two. The oversight is understandable since 5 years ago even two serial ports may have seemed superfluous. Then the only device that anyone needed to connect in a serial port was a modem.

Today, your two-port PC is functionally crippled. Contemporary computer peripherals use up serial ports as fast as moviegoers eat up popcorn.

You may find, for example, that one modem is just not enough for your system. Or you might want to connect a mouse, an optical character reader, a serial printer, a Polaroid Palette film recorder, and some other strange and mysterious hardware that must communicate with your PC. If you've got an AT, you might need to connect half-a-dozen dumb terminals to get your sophisticated multiuser system buzzing efficiently.

The problems with adding more than two serial ports to any PC run deep. While simple hardware additions have overcome the memory, hard disk, and power shortfalls in the original PC design, the serial shortage is inherent in the structure of both DOS and IBM Corp.'s BIOS (Basic Input/Output System) firmware. Arbitrary design choices limit both the system firmware and the operating system to the supporting two ports. DOS has built-in recognitions for the names of only two COM ports. And the IBM BIOS, the preferred

## ■ MULTIPORT SERIAL CARDS

low-level hardware device interface of all PC compatibles up to and including the AT, accepts designations for only two serial ports.

This story investigates hardware that breaks the two-port limit in a big way: the five multiport serial cards that are tested and reviewed in this article and the other three similar boards discussed in the accompanying sidebar will each at least quadruple the PC's serial port quota. Each of the products uses its own clever design strategy and each has its own strengths and weaknesses.

**ELECTRONIC IQ** The multiport serial cards investigated here can be roughly divided into two distinct designs, the *intelligent* and the *dumb*, terms that describe their on-board computational power. At a superficial level, the dividing line is plain. Intelligent cards incorporate a microprocessor. Dumb boards don't. But the differences are deeper, with manifold implications.

Dumb cards are the most straightforward, using the brute force technique of adding one asynchronous communications chip, usually a UART (Universal Asynchronous Receiver/Transmitter), such as the 8250 used by IBM in the original Asynchronous Communications Adapter or the newer, faster 16450 used in the AT's combined parallel and serial adapter. These chips are under direct control of the host system, and, for the most part, the async chip on which they're based determines their communications capabilities. The async chip also determines possible data rates, word lengths, number of stop bits, and parity, which are all determined by the async chip and are generally the same for all products using that chip.

Intelligent cards use their microprocessors to create and control their communication functions. The built-in microprocessor intelligence allows such adapters to handle communications independently of the operation of the host system. They can internally buffer both input and output data as well as control handshaking, all without stealing cycles from the host CPU.

Strangely, interfacing the smarter cards with the host system can be more difficult than interfacing the dumb cards. Dumb

cards require essentially the same programming techniques to access at the hardware level as standard IBM serial adapters require. Often only the I/O (Input/Output) port addresses used to access the registers in the async chips are different. (A few otherwise dumb multiport serial cards use more intricate control systems, however.) Intelligent cards may work entirely differently, requiring special commands to control their operation and special software routines to send and receive data.

To some extent, the intelligence of a multiport serial board affects how fast it can handle multiple streams of high-speed data. Although a single serial channel operating at 1,200 bits per second is no chal-

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■ Intelligent cards  
incorporate a  
microprocessor.  
Dumb boards don't.  
But the differences are  
deeper, with manifold  
implications.

---

lenge for any computer in the PC realm, when data rates climb to IBM's official 9,600 bps maximum and eight channels are all demanding immediate attention, communications systems can sometimes become strained.

In most cases, the speed at which multiport serial cards operate depends more on the computer you're using and the application you're running than on the specific serial card you choose. But there are some important exceptions. Smart cards can help your system operate faster because they share some of the processing time. On the other hand, some older intelligent cards might have their hands so full handling eight high speed serial ports simultaneously that they might impose their own speed limit on communications. (PC Labs tests found that none of the products reviewed here suffered from such limits,

even when all eight ports operated at 9,600 bps.)

**MATCHING DOS** The intelligence of these serial products and their interfacing considerations are, for the most part, important only when you want to attempt to write your own software to control the added serial ports.

On a more practical level, the means of gaining access to serial ports depends on what the applications you choose to use require, and it is wise to discern these applications before buying. As long as the software you regularly work with has built-in support or an add-on driver that's compatible with the multiport serial card of your choice, you have little to worry about.

If you want to use serial ports beyond COM2 at the DOS level or through a programming language, you'll need a device driver or some other kind of hardware hook to make the ports available to your commands. Most of these multiport products make some sort of DOS driver available, and most also offer support for other operating systems, such as Xenix. Beyond that, they give you one or more different strategies to control their added serial channels.

Installable device drivers allow DOS to recognize additional COM ports in any commands, such as TYPE and COPY, that access devices. (The standard DOS MODE command, which changes serial port parameters such as data rate and word length, ordinarily will not recognize ports added through device drivers, and you must use some other means to set port parameters, for instance, an alternative, MODE-like utility.)

Some products include special programs that substitute themselves for parts of IBM BIOS, specifically the interrupt 14h routines that control asynchronous communications. They extend the normal function of the interrupt so that it recognizes more than two serial devices, giving you control of your added ports at the BIOS level.

Another port-handling strategy is low-level hardware control. Operating a serial channel at this level requires in-depth knowledge of not only your system hardware but also the multiport cards. With most dumb cards, you'll probably also



## Multiport Serial Boards: Summary of Features

Product	Price	Ports per board	Maximum ports per system	Speed (bps)	DTE or DCE	Connectors	Compatibility	Drivers available from manufacturer
Quarrel	\$299	4	8	50-38,400	DTE	DB-25 female	XT or AT	None
Versanet-BAT	\$495	8	64+	50-115,200	DTE	DB-25 female	AT	DOS, IBM Xenix, SCO Xenix
Star Gate OC8000	\$520	8	32	50-9,600	DTE	DB-25 female	XT or AT	DOS, SCO Xenix
WNIM-Z80	\$525	4	16	50-19,200	Software defined	DB-25 male	XT or AT	Novell (async) Gateway (single user)
Hostess 8	\$695	8	16	50-19,200	DTE	RS-232-C DB-25, male or female	XT or AT	DOS, IBM Xenix
LAMB	\$695	8	32	50-9,600	DTE	DB-25 male	XT or AT	DOS, IBM Xenix, SCO Xenix
Arnet Multiport	\$735	8	96	50-56,000	User configured	DB-25 female	XT or AT	DOS, IBM Xenix
AT-Vantage-N	\$995	8	16	50-38,400	DCE	DB-25 male, RJ-45	XT or AT	DOS, IBM Xenix, SCO Xenix

have to be familiar with the operation of the async chip they use. Good documentation is essential.

### COMMUNICATION CONNECTION

Even the seemingly trivial matter of connection and connectors can be important when you're adding one of these multiport serial cards to your system. Part of the problem is purely aesthetic. There is simply insufficient space to mount eight serial connectors on a host computer without drilling and nibbling holes in it. Little wonder, then, that all the multiport serial cards examined here include some form of chassis extension or connector box to tie into cabling.

The connections different multiport products provide can be subtly different. All serial ports can be classified as being either DTE (Data Terminal Equipment) or DCE (Data Communication Equipment), acronyms that describe the function of several of the pins in the standard serial connector. All IBM-standard serial ports are classified as DTE, which means they require use of a straight-through cable to connect to a DCE device (such as a modem) or a null-modem cable, which reverses some of the connections, to connect to another DTE device (such as another IBM computer or a serial printer). Some multiport products give you the choice of defining ports as DTE or DCE; others lock you into one definition or another.

Unless you're designing systems or

writing software, the bottom line when buying a multiport serial card is thus mostly a matter of finding hardware that the application you want to run supports. When you have a choice of several products, your biggest concern may be connectivity, and you'll want the system with the fewest interconnection hassles.

### LAMB

American Micronics combines almost rudimentary hardware and an extensive set of software drivers to make its LAMB (Local Area Multiuser Board) one of the most versatile multiple-serial-port boards available. You can install up to four of these eight-port boards in a single PC, to yield a total port count of 32 per system. Two of the ports on the LAMB card are switchable between normal DOS use as COM1 and COM2 or meta-DOS applications. Both IBM Corp. and Santa Cruz Operation Xenix System V drivers are also available.

Each of the eight serial channels on the LAMB full-length expansion board uses its own 16400 async chip. It connects to the host computer through an eight-bit bus using a PC-XT-style edge connector.

The LAMB board really looks more like an octopus than it does a sheep. Two wide-ribbon cables slip through a large slot on the board retaining bracket; then each of these cables divides four ways, ending in a separate male DB-25 connector. Though perhaps somewhat inelegant, this connec-

tion scheme is entirely functional.

As with the serial channels normally assigned by DOS, each channel on the LAMB requires eight contiguous system I/O port addresses. DIP switches on the LAMB assign I/O addresses to start at either 240 (Hex), 280 (Hex), 2C0 (Hex), or 300 (Hex) in XT's or 100 (Hex), 140 (Hex), 180 (Hex), 280 (Hex), or 2C0 (Hex) in AT's. All ports on the board share a single hardware interrupt, and switch settings allow assigning IRQ2 through IRQ7 to this purpose.

A special-status I/O port is available so that software drivers can monitor the interrupt status of each port. To avoid conflicts, DIP switch settings can change the address assigned to this port.

Other DIP switch settings permit *split* or *continuous* operation. The LAMB may be split so that one or two of its ports can be devoted to either COM1, or COM2, or to



### FACT FILE

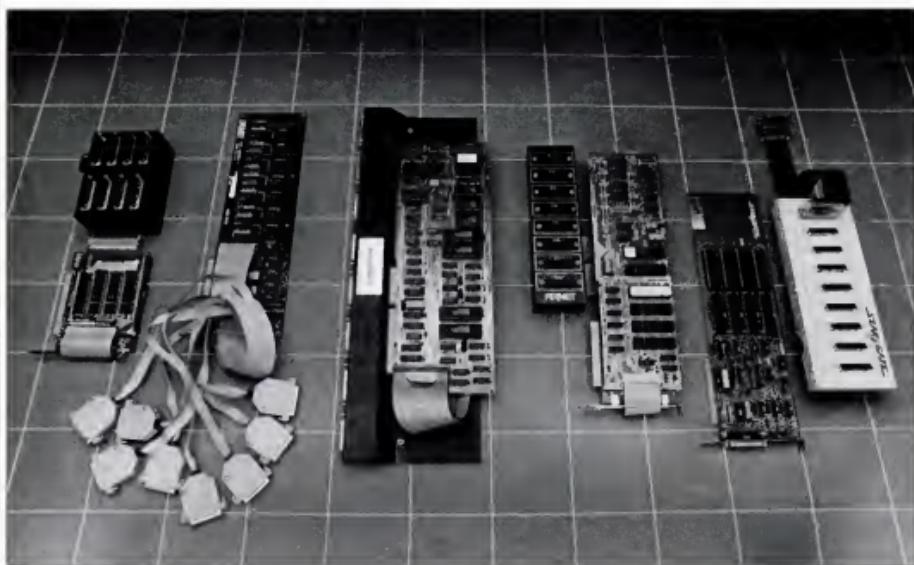
#### LAMB

American Micronics Inc.  
17811 Skypark Circle, H  
Irvine, CA 92714  
(714) 261-2428  
List Price: \$695

In Short: One of the more-versatile multiport serial cards. Up to four of the eight port cards can be attached to one PC.

CIRCLE 697 ON READER SERVICE CARD

## ■ MULTIPORT SERIAL CARDS



*Although their designs are easily distinguished from one another, the five multiport serial cards we reviewed have one thing in common: they are all capable of supplying eight serial ports. Left to right: Control Systems' Hostess 8, American Micronics' LAMB, Computone Systems' AT-Vantage-M, Arnet Controls' Multiport, and Star Gate Technologies' OC8000.*

both. In split mode the normal interrupt assigned by IBM BIOS is used exclusively by its associated DOS COM port: IRQ4 for COM1 and IRQ3 for COM2.

A special driver, COMMBIOS, written by Commtech, of Wichita, Kansas, is supplied for DOS applications. COMMBIOS provides an extreme degree of compatibility by extending the normal IBM BIOS interrupt 14h so that it can address all the LAMB's ports. At the DOS level most of the normal DOS utilities can handle each port.

To bring the extra communications channels to life, you must first run a special driver, COMMDRV.SYS, from the host system's CONFIG.SYS file. Then the COMMBIOS program is executed.

You may then use most DOS commands normally with the additional ports, with the exception that the names of the additional ports do not end with a colon. Be-

cause DOS's MODE.COM cannot access ports beyond COM2, a substitute program, CMODE.COM, is supplied to handle that chore.

For even greater flexibility, this driver allows each port to be configured in one of three distinct modes, eliminating most of the need for special cables and adapters. In Direct mode, only the transmit, receive, and ground connections are required to operate each port; hardware handshaking signals are ignored. In Full Modem mode, all hardware signals are used normally. The Individual mode allows the two choices of mode to be used individually for each port.

To aid you in writing the necessary software, the LAMB supplies sample terminal programs, together with their source code in BASIC, C, FORTRAN, and Pascal. System developers will likely find that the biggest shortcoming of the LAMB is its sometimes rather sketchy, incomplete

documentation. End users should have no problem setting up or connecting the LAMB, though.

### Arnet Multiport

If you've chosen a multiuser operating system for your XT or AT, odds are you'll find the Arnet Multiport from Arnet Controls a quick and easy way to add four or eight serial ports. Its documentation explicitly describes recommended settings for 11 operating systems, including MBOS/5 and BOS/LAN from BOS National, MUC-DOS from Haar Industries, Coherent from Inetco, Formula IV from Dynamic Microprocessor Associates, PC Share from Digitrol, PICK from Pick Systems, QNX from Quantum, THEOS from Theos Software Corp., Venix/86 from Unisource Software Corp., MUMPS from Datatree, and Xenix System V from the

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## ■ MULTIPORT SERIAL CARDS



### FACT FILE

#### Arnet Multiport

Arnet Controls Inc.  
476 Woodcrest Ave.  
Nashville, TN 37210  
(615) 254-0646

**List Price:** \$735 for the Multi-8 kit (includes a Multi-4 board and a Plus-4 board).

**In Short:** A quick and easy way to add either four or eight ports to your PC.

CIRCLE 696 ON READER SERVICE CARD

Santa Cruz Operation, as well as for Easy-LAN from Server Technology and, of course, DOS.

The hardware itself is quite simple, merely a single full-length expansion board sparsely populated with four 8250 async chips and support circuitry for the first four serial outputs. You can snap a half-length daughtercard onto this card to add a second set of four serial channels. Another daughtercard, also half-length, optionally adds a battery-backed-up clock. The Multiport card uses an XT-style 8-bit data bus and is compatible with both XT's and AT's.

Several Multiport boards may be used in one system, limited only by the number of slots and I/O addresses available. Like most boards using similar designs, the Multiport requires a total of 64 consecutive addresses in the I/O area of its host computer, eight addresses per serial channel. A DIP switch on the Multiport board allows you to set the base address anywhere in the normal microprocessor address space, and the documentation clearly illustrates each individual setting. Another DIP switch allows you to select a single interrupt to service the board from within the range of IRQ2 through IRQ7.

The connecting hardware consists of a heavy-duty black box, 1½ inches high by 9 inches wide by 2½ inches deep, with eight female DB-25 connectors running across its width. It snaps onto a metal panel that slides underneath the host computer, somewhat differently from the way shown in the accompanying documentation.

The box-holding panel has enough room for two eight-connector boxes. There are two wide-ribbon cables that connect the Multiport board to the box through

a slot in the card's retaining bracket.

Jumpers inside the connector box allow configuring most of the ports as either DTE or DCE. Two ports, numbers one and five in an eight-port system, cannot be so modified and function solely as DTE.

The Arnet DOS driver is loaded in the host system's CONFIG.SYS file. Each port requires its own configuration file so that the driver knows the port's communications parameters. The system includes a prototype configuration file, which you can copy multiple times and modify separately for each port with any ASCII-compatible editor. The configuration file lists the changeable parameters—from I/O port addresses to data rate and word length. You merely edit them to reflect the desired operating parameters.

Overall, Multiport's elementary design and clear documentation make it one of the easiest boards of its type to install and get functioning, particularly with the most common multiuser operating systems.

### AT-Vantage-M

On a pure electronic I/O basis, the AT-Vantage-M from Computone Systems must rate as the most intelligent of the serial boards investigated here. Based on an 8088-2 microprocessor, the AT-Vantage-M should be able to run circles around an ordinary PC or XT.

Four on-board Z80 serial I/O controllers are capable of handling up to eight communications lines. The system is designed so that two boards can be ganged, for a total of 16 separate and distinct serial ports per host system.

Designed strictly for the AT, the AT-Vantage-M is also one of few serial boards to use that computer's 16-bit data bus. The AT-Vantage-M requires a 64K-byte range of memory addresses within the host 80286 microprocessor's real (RAM data) address area. DIP switches allow you to select this range.

The intelligence of the AT-Vantage-M is put to work managing communications handshaking. Both XON/XOFF and hardware Busy/Ready, using either the CTS or the CDC and the RTS or the DTR leads, are supported wholly on-board, with no need for host attention. Further, each of the board's eight ports has its own 256-

character incoming buffer and 128-character outgoing buffer.

The AT-Vantage-M can support asynchronous communications at rates of up to 38,400 bits per second using word lengths of from 5 to 8 bits. Most system operating parameters are fully programmable, including the handshaking on and off thresholds (that is, the number of characters in the data buffer that trigger the transmission of a handshaking signal) and even the characters sent for software handshaking. Interrupts, too, are fully programmable.

About 1K RAM is available on the AT-Vantage-M board to handle user programs—for instance, to screen incoming characters even before they are added to a character buffer.

The connecting hardware, one of the neatest installations in this product area, is designed strictly for the AT. Computone supplies a metal connector strip complete with eight male DB-25 connectors arranged in a straight line, narrow edge to narrow edge across its width, which matches that of the AT. The strip mounts to the bottom of the AT chassis, and two wide-ribbon cables connect it to the AT-Vantage-M card, running through a wide cutout in the card's retaining bracket. The entire installation is reassuringly sturdy.

Software included with the AT-Vantage-M includes an MS-DOS driver, which loads through the host system's CONFIG.SYS file and assigns a distinct device name—ATV0 through ATV7—to each of the AT-Vantage-M ports. The source code of this MS-DOS driver (written in the C programming language) is supplied with the board. Another program listing documents the AT-Vantage-M's



### FACT FILE

#### AT-Vantage-M

Computone Systems Inc.  
One Dunwoody Park  
Atlanta, GA 30338  
(404) 393-3010

**List Price:** \$995

**In Short:** Designed specifically for the AT, the AT-Vantage-M makes use of the AT's 16-bit data bus.

CIRCLE 696 ON READER SERVICE CARD

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## OEMs AND SYSTEM INTEGRATORS, TAKE NOTE

*Three other multiport boards share the market with the five boards we tested. They require special programming skills, but their unusual and adaptable features make them especially useful in specialized applications.*

Three other multiport boards are available, aimed primarily at OEMs and system integrators who can write the programs to put them to work. Their drivers for the Xenix operating system, used for the PC Labs tests, weren't provided, so we didn't test them. But if you're thinking of implementing a multipoint system, you should consider them, since their special features make them useful in specialized applications.

### WNIM-Z80

The WNIM-Z80 (Wide Area Network Interface Module) from Gateway Communications is an intelligent communications board that moves information to its host computer directly through memory. Requiring one full slot and using the stan-

dard XT-style 8-bit expansion bus, one WNIM-Z80 can handle four serial channels, and one system can use several of these boards.

The heart of the board is a Z80 microprocessor and 64K bytes of dual-ported RAM. The memory occupies the full Z80 address space and a block of non-DOS memory in the host system. You must download the program that runs the Z80 from the host into the WNIM-Z80 RAM. Even the memory refresh program must be loaded before the system will work.

Several I/O addresses are used to monitor and control the microprocessor, the DTR/DSR handshaking, and other board functions.

Since it is totally software defined, the

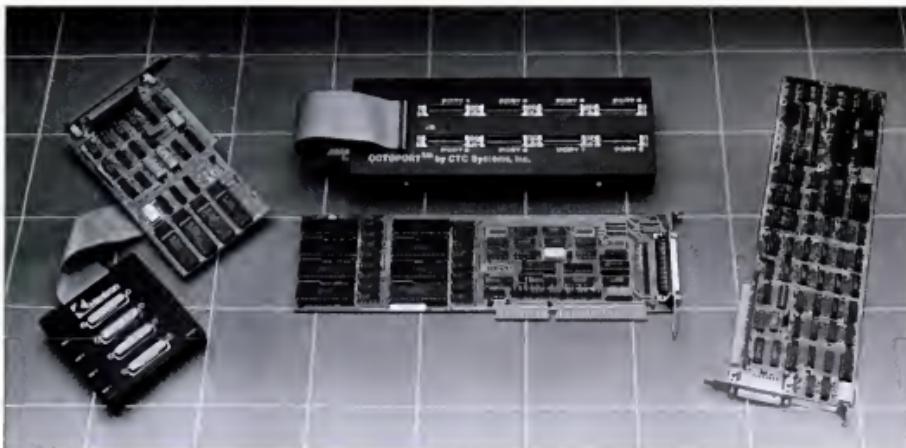
WNIM-Z80 is uniquely flexible. Of course, since no drivers are provided with the product, getting the system to work requires familiarity with both 8088 and Z80 assembly languages.

### Quartet

By itself the Quartet board from Kimtron Corp. adds four serial channels to any PC. You can also combine several Quartet boards for even more channels.

Compatible with full-size IBM-standard personal computers (PCs, XTs, and ATs), the Quartet uses an 8-bit data bus. Although the card is shorter than an expansion slot, at nearly 8 inches it is too large to fit an XT short slot.

Each serial channel on the Quartet uses its own 8250 async chip, and all



*These multiport serial cards are best used in custom-designed applications. Left to right: Kimtron Corp.'s Quartet, CTC Systems' Versanet-8AT, and Gateway Communications' WNIM-Z80.*

channels are configured exactly the same as standard IBM serial ports, with the same registers directly addressable through I/O addresses. You can move the base address of the board through a wide range by setting two banks of five DIP switches. Each serial channel is connected to its own female DB-25 connector on a free-swimming black metal box roughly 1 inch high by 4 inches wide by 4 inches deep.

The worst aspect of the Quartet is its skimpy documentation. Not only is the documentation brief (a single sheet folded into a six-page brochure), it's incomplete and inaccurate.

No drivers for any operating system—DOS, Xenix or whatever—come with the Quartet. By properly assigning the board base address, however, one port of the Quartet could be made compatible with DOS COM1 or COM2, but not both simultaneously. Any other compatibility must be achieved below the BIOS level with direct access to the 8250 registers through I/O addresses.

## Versanet-8AT

CTC Systems' Versanet-8AT is uniquely versatile, able to make its eight on-board serial ports look to your system like eight ordinary asynchronous communications adapters or a single very flexible port. All eight serial links can share the same set of eight I/O port addresses or operate as individual ports, consuming the full 64 addresses required by eight serial channels. The card's trick is a hardware latch that switches serial channels on- and off-line with the host, one at a time.

When in the more conventional configuration, the Versanet-8AT can be set up so that the first two on-board serial links function as ordinary DOS COM1 and COM2.

The Versanet-8AT uses the full 16-bit AT expansion bus, as do companion models with six- and four-port capabilities. It connects to the outside world with eight female DB-25 connectors mounted

on a special black box called the Octoport, which is 1 inch high by 11 inches wide by 4 inches deep. All its ports are unchangeably configured as DTE.

CTC Systems supplies a special driver with the Versanet-8AT board to intercept the interrupt 14h routine to make the product compatible with IBM BIOS. After the driver has been loaded, typically in the host system's CONFIG.SYS file, the function of the interrupt 14h routine is then extended to embrace the larger number of available ports. Of course, using this driver requires software written to take advantage of it at the BIOS level.

—Winn L. Rosch



## FACT FILE

### WNIM-Z80

Gateway Communications Inc.  
167H Redbill Ave.  
Irvine, CA 92714  
(714) 553-1555

List Price: \$525

In Short: This unusual board moves information between the host and its channels, not through I/O addresses but directly through memory.

CIRCLE 600 ON READER SERVICE CARD

### Quartet

Kimtron Corp.  
1705 Junction Ct., Bldg. 160  
San Jose, CA 95112  
(408) 436-6550

List Price: \$299

In Short: As its name implies, the Quartet adds four ports, but several can be added to one machine.

CIRCLE 601 ON READER SERVICE CARD

### Versanet-8AT

CTC Systems Inc.  
1031 S. De Anza Blvd., #4  
Cupertino, CA 95014  
(408) 725-0501

List Price: \$495

In Short: The Versanet-8AT, with its eight on-board serial ports, is notable for its versatility and adaptability.

CIRCLE 602 ON READER SERVICE CARD

features and programming hooks that the Computone driver doesn't use.

Because the ATV0 device names are not within DOS's normal ken, communications port parameters cannot be changed with the MODE command. Computone supplies a program called ATVMODE.COM, which substitutes for the regular DOS utility.

Commercial software that looks for device names with the COM prefix may be unable to address the board's many ports, but most of the higher-level programming languages and some of the normal DOS utilities can use the ATV device names, for instance, to use COPY to move files through the ports.

The AT-Vantage-M is a product best used by system developers. Computone has provided a number of applications notes detailing the use of the AT-Vantage-M in Xenix systems, including many C language source code listings.

## Hostess 8

Control Systems' Hostess 8 is a combination hardware and software product that's elegant in its simplicity and yet has great power that's readily put to use in the DOS environment.

The basic Hostess system is a short card, about 5 inches long, with an 8-bit bus, designed to fit in either an XT or an AT. The actual circuitry is minimal: four 16450 async chips and the necessary bus decoding logic. A daughterboard adds four more async chips, for a total of eight serial channels in a two-layer package that's just under  $\frac{1}{8}$  inch thick (the width of a single XT slot).

Various connector options are available: male or female DB-25 all-around or AT-style 9-pin male connectors. Hostess models with eight connectors, like the Hostess 8 reviewed here, use a black metal box  $\frac{3}{4}$  inches high by 5 inches wide by  $\frac{1}{4}$  inches deep to hold the hardware in four rows of two horizontally oriented connectors. A fold at the back edge of the box slips over the top edge of the host computer chassis, and, on ATs, a screw at the bottom secures it in place. Two wide-ribbon cables connect the Hostess card and its connector box through a nearly full-length notch in the card's retaining bracket.

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#### ■ MULTIPORT SERIAL CARDS



#### **Benchmark Test: Xenix Serial Port File Transfer Rate**

A remote IBM PC-XT terminal running under Crosstalk XVI performs the test function at equal speeds for four of the five multiport serial cards reviewed. As one might expect—and for comparison purposes only—a dedicated video display terminal performing the same test would run an estimated 70 percent faster.

Of the five boards tested, the AT-Vantage-X proved to be the fastest by 15 to 23 percent when three terminals were running on the system. Initially, the work required to install proprietary Xenix drivers for the AT-Vantage-X seemed to be a drawback, but with all other components remaining the same, it appears that the effectiveness of those drivers was the telling factor in producing the faster speeds.

## Performance Times

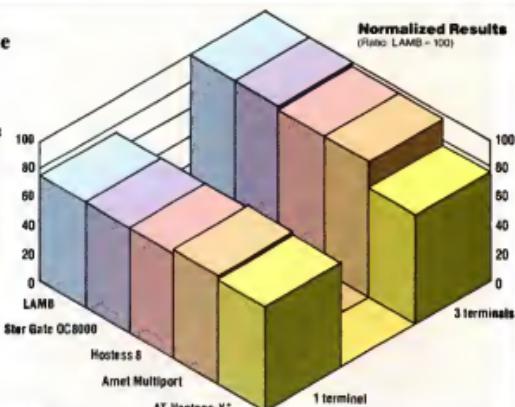
Product	1 terminal	3 terminals
LAMB	37	49
Steri Gate OC6090	37	49
Hoseliss 8	37	48
Armet Mullipor I	38	48
AT-Vantage-X™	37	38

```
main ()  
{  
    int i,j ;  
    for (j = 0 ; j < 100 ; j++)  
    {  
        for (i = 0 ; i < 79 ; i++)  
            printf ("%c") ;  
        printf ("\n") ;  
    }  
}
```

**Figure 1:** Source code for the C program used to paint the monitor's screen. The results of this test were not included in the benchmark-test results because they were used only to monitor the terminal's performance within its own context.

```
date '+%M:%S' >>screen.log  
screen  
date '+%M:%S' >>screen.log  
date '+%M:%S' >>disk.log  
date '+%M:%S' >>temp.log  
date '+%M:%S' >>disk.log  
rm temp.log  
date '+%M:%S' >>file.log  
cat words  
date '+%M:%S' >>file.log
```

**▲ Figures 2:** This is the batch file (called "a script" file in Xenix) used to initiate and record the test results. The first three lines redirect a formatted date command into a file called "screen log" (the formating results in only the minute and second appearing). These times track the monitor update speed. The next three lines time a simple file creation and date write, while the seventh line removes the temporary file thus created. They, too, were used only to track the terminals' system performance within their own context. The last three lines initiate and time the actual file transfer that was the substance of the benchmark test.



The Serial Port benchmark test measures the time it takes to transfer a 20K-byte data file from the directory of a 5-MHz IBM PC AT to the screen of a remote PC-XT terminal. The remote PC-XT terminal ran under CrossTalk/XV. A second trial of the same test transfers the data file to three remote PC-XT terminals. Wherever possible, the multiport serial boards functioned under the Santa Cruz Operations' Xenix System 5, Version 2.1.3, without the use of additional drivers (instances where proprietary drivers were needed have been footnoted).

\*The AT-Vantage-X used its own proprietary port drivers. Also note that the AT-Vantage-X is actually the AT-Vantage-M, as reviewed, with an EEPROM substitution to enable its Xenix personality.

**Figure 3:** This Xenix batch file runs the script ▲ "SCRIPT" 20 times. After all of the data has been written to disk, the times are collected and await processing. A separate Compiled BASIC program was used under MS-DOS to gather all of the raw data and adjust it into useable form.



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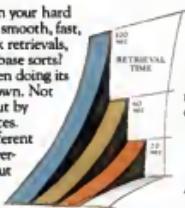
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## MULTIPOINT SERIAL CARDS



### FACT FILE

#### Hostess 8

Control Systems Inc.  
2675 Patton Rd.  
P.O. Box 64750  
St. Paul, MN 55164  
(612) 631-7800

#### List Price:

\$695

**In Short:** The Hostess 8 is simple, yet it has great power to put to use in a DOS environment.

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Each of the eight serial channels of the Hostess 8 requires eight system I/O port address assignments, and the entire 64-address block must be contiguous. You can use DIP switches to select the base address of the port assignments nearly anywhere within the IBM port address space. Recommended starting addresses are 2E0 (Hex) for four-port Hostess versions and 2C0 (Hex) for eight ports, in each case putting the last port at 2F8 (Hex), which DOS normally assigns as COM2. Another DIP switch bank controls the hardware interrupt used by the Hostess system from the range IRQ2 through IRQ7.

Once you've installed the board in the host computer, Control Systems recommends that you test the board with the rigorous diagnostic program it supplies. This program, HOSTEST, checks nearly every operational aspect of every serial channel.

The Hostess 8 software endows a high degree of DOS compatibility to each serial channel through normal device drivers loaded in the host system's CONFIG.SYS file. Because of the amount of configuration information required, the list of instructions in the file can be quite complex. Two drivers are required to handle the card in general, and an additional driver is required for each serial channel.

The DOS names for each port (for example, COM4), as well as the communications parameters (data rate, word length, number of stop bits, and parity), are all specified in the configuration of the device driver. Although the software allows a selection of data rates up to 56,000 bps, the maximum rate allowed for the hardware is 19,200 bps. You can select the size of the character buffer (up to 32K) and the time-

out period in clock ticks (0-65,534, roughly 1/20 second to 1 hour, and infinity).

The eight Hostess 8 serial channels are accessible through DOS as ordinary devices and are recognized by all higher level programming languages that use normal DOS I/O calls to access communications ports. IOCTL calls are fully supported at the user's option.

The individual serial channels are also accessible by low-level languages like assembler, either through DOS function calls or direct addressing to the hardware, as with the normal system COM1 and COM2. To help you develop your own programs to use the Hostess 8, Control Systems includes illustrative source listings for terminal emulators in both IBM BASIC and assembler.

## Star Gate OC8000

Capable of adding four to eight serial channels to a PC, XT, or AT, the Star Gate OC8000 from Star Gate Technologies requires one full-length 8-bit expansion slot. (A similar, nonexpandable product with only four ports, the OC4400, is also available.) Four 8250 async chips are soldered to the circuit board, and up to four more may be added in sockets.

Each 8250 is devoted to a single serial channel, and its registers are accessed identically to those on the IBM Asynchronous Communication Adapter. Hence, each port is capable of operating between 50 and 38,400 bits per second.

Each serial channel uses eight system I/O port addresses. The OC8000 can assign these in one of two schemes.

In one scheme the first two serial channels use the addresses starting at 03F8 (Hex) and 02F8 (Hex) and are thus compatible with DOS devices COM1 and COM2, respectively. The other six serial channels occupy the 24 contiguous addresses starting at 0280 (Hex).

In the other scheme the 32 contiguous ports starting at 0180 (Hex) must be given to the board. Because these address ranges do not overlap, two OC8000 boards in one system total 16 serial channels.

Interrupts may be assigned to the board in one of two configurations. All ports can share any interrupt from IRQ2 to IRQ7; or the first two ports can use IRQ4 and IRQ5,



### FACT FILE

#### Star Gate OC8000

Star Gate Technologies Inc.  
33800 Curtis Blvd., #109  
East Lake, OH 44094  
(216) 951-5922

#### List Price:

\$520

**In Short:** The OC8000 adds from four to eight serial ports to a PC, with a minimum of hassle.

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respectively, and the other ports share another interrupt (IRQ2 or IRQ5-7) or operate without one, in polled mode.

Each serial channel is provided with its own female DB-25 connector, and all the connectors are mounted on a metal box about 1 inch high by 10 inches wide by 3 1/4 inches deep. A 1-meter-long shielded ribbon cable runs between a male DB-25 connector on the box and an identical connector on the OC8000 retaining bracket.

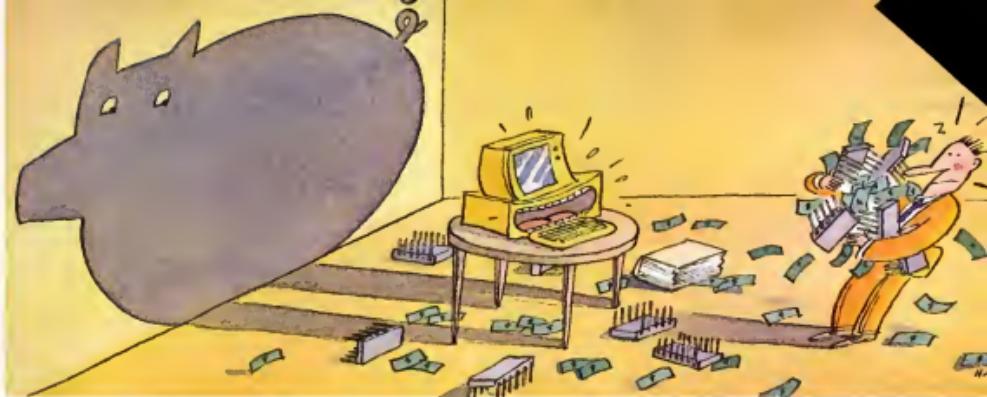
The 25 conductors in this cable cannot carry all the data and handshaking signals needed for eight ports. Only the first port supports hardware handshaking. For all other serial channels, only the transmit and receive signals are in the connectors, and hardware handshaking is not possible.

The signal assignments for the first serial channel in the cable that links the OC8000 to its connector box correspond to normal RS-232 layout. If all the other conductors on the cable are left floating, you can plug a single serial device directly into the OC8000, making it one of the most expensive single-channel serial adapters.

With the exception of the lack of hardware handshaking abilities on COM2, the first two ports of the OC8000 are DOS compatible without additional software. A device driver is available from Star Gate to make the remaining ports accessible to DOS and higher-level languages. Star Gate can also supply drivers for Xenix and interrupt-driven applications.

Star Gate also makes the ACL (Advanced Communications Link) card. It offers its own 8088 microprocessor, scratch RAM, and dual-ported memory.

*Winn L. Rosch is a contributing editor of PC Magazine.*



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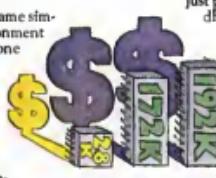
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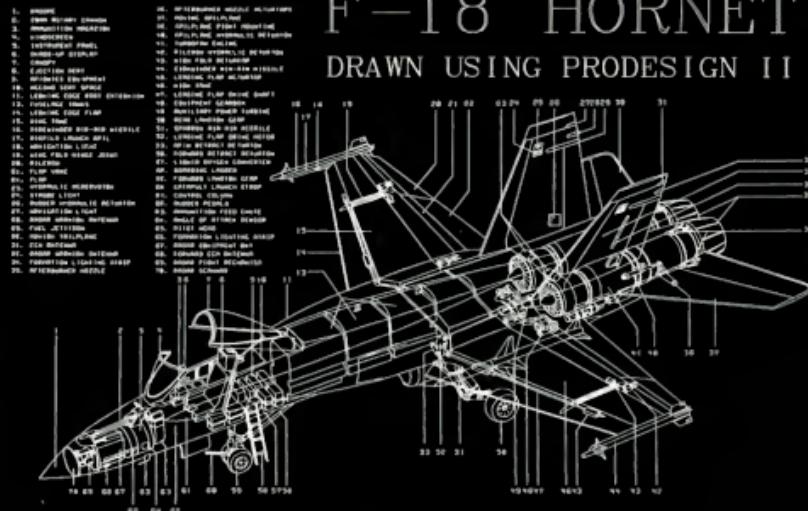
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# MAKING AN IMPACT WITH GRAPHICS

*A column of spreadsheet figures can say only so much, but a graph can speak volumes. With business graphics packages like these, you can make a stronger impact with presentations that use slides and pictures that dazzle the eye as well as the mind.*

**D**o your reports end up in your intended readers' trash cans while your competitors' documents get circulated throughout your industry? Do the audiences at your presentations begin to snore long before your closing? Are you tired of seeing your competitors win friends and influence people with their business presentations while you don't seem to get anywhere?

The answer is graphics. Illustrations like graphs, charts, and other line drawings can often convey your message better than even your most finely crafted words or carefully calculated rows of numbers. What's more, they make your reports and presentations more interesting and therefore more effective. If you lack the advantages of graphics training or an in-house art department, you can still put some graphic zip into your presentations. All you need is

your PC and a business presentation graphics package. All six graphics packages reviewed here can perform tricks that will wake up your audiences and give your messages more impact.

Some of the programs support film recorders, which means that they'll make slides for you. And almost any plotter will produce a transparency instead of output to paper if you change to the proper kind of pens and load a sheet of acetate. A couple of these packages will even produce timed, automatic shows to run on your PC itself.

To evaluate and compare the programs, I created a standard graph, using *Microsoft Chart*. Then, with each of the programs, I created a similar graph, sharing the same data and using all the enhancements the software could produce within a reasonable time in a business setting.

One of the most useful though least at-

## BUSINESS GRAPHICS



### Presentation Graphics Programs: Summary of Features

Program	Price	Imports Lotus's named graph	Imports Lotus's PIC file	Imports Lotus's DIF file	Color plots	Image library	3-D	Shows icons on screen	Dot matrix support	Printer support	Laser support	Film recorders
Perspectiva	\$295	○	○	●	○	○	●	●	●	○	●	○
Freelance	\$395	○*	●	●	●	●	○	○	●	●	●	●
Harvard Presentation Graphics	\$395	●	○	○	●	Symbols	Partial	●	●	●	●	●
Decisive Graphics	\$450	○	○	●	●	Few icons	●	●	●	●	●	●
Graphwriter	\$495	○	○	○	●	○	○	●	●	●	●	●
The Gallery Collection	\$695	●	○	●	●	●	○	●	●	●	●	●

\*—Indicates Editor's Choice

○—Yes

○—No

\*Freelance Plus is capable of importing Lotus's named graph.

tractive graphs in the business world is a line chart. Bar charts and pie charts can impress an audience with color or texture, but a line chart is more limited to the basics. For this reason, I created a sample line chart in *Microsoft Chart*.

Although *Chart* offers far more sophisticated capabilities, its role for this project

was limited to producing an easy-to-read graph to serve as the point of departure for all the other programs. (Bear in mind that the point of a chart is to impart information; too many graphic enhancements may blur, rather than clarify, the image.)

release works only in black and white (a color version is in the works), the lack of color does not detract from the program's impact.

Installation is by batch file. As *Perspective* loads, you'll see a quick montage of data loading into the Data Manager module, followed by the building of a three-dimensional graph from that data. This show finishes up with the materialization of the images of five labeled function keys that inform you what your initial options are.

For example, the F1 key is Select 3D

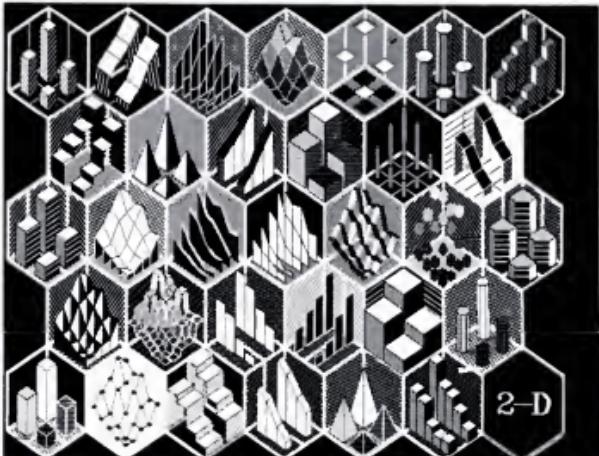
#### EDITOR'S CHOICE

*The Editor's Choices are Perspective and The Gallery Collection. With its 32 three-dimensional charts, which you can display at an almost infinite number of angles, Three D Graphics' Perspective has truly staggering capabilities. The current version, however, has some significant omissions: it lacks several popular types of graphs; its annotation capabilities are restricted; and it has no illustration library, color, or plotter support.*

*Hewlett-Packard's The Gallery Collection has none of these problems. The combination of Charting Galler with Drawing Galler definitely makes it a state-of-the-art, easy-to-use product. From its ability to import 1-2-3 and Symphony named graphs instantly, to the ingenious way you can customize a graph with a few mouse clicks, the program encourages productivity. The Gallery Collection has the best all-around mix of capabilities.*

### Perspective

From the minute you boot up *Perspective* from Three D Graphics, you realize that it's vastly different from any other PC graphics program. Although the current



*This screen reproduction exhibits the 32 3-D forms your graph can assume in Perspective. By highlighting the 2-D cell at the lower-right-hand corner of the display, you can also choose from among 15 2-D graph layouts.*

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## BUSINESS GRAPHICS



### FACT FILE



#### Perspective, Version 1.0

Three D Graphics  
860 Via de la Paz  
Pacific Palisades, CA  
90272  
(213) 459-8525

List Price: \$295  
Requires: 512K RAM,  
two disk drives, a graphics card, a parallel  
printer with graphics capability, DOS 2.0 or  
later.

In Short: Easy-to-use, it produces eye-catching black-and-white 2D and 3D business graphs in many formats. Not copy protected.

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**Graph Type.** Press it and an intricate screen demonstrating 32 different types of three-dimensional graphs appears. Select one of the types and the sample graph is converted as you watch. The process includes the relocation and sizing of all titles and labels.

Next, pressing F2, Select Viewing Angle, gives you the choice of 16 different angles from which the graph can be immediately redrawn. Pressing F5 offers custom graph options, one of which will let you rotate the image on any or all of its three axes to select the exact angle that best shows your data. *Perspective* also offers 15 kinds of two-dimensional options, contained in a separate module.

*Perspective's* capabilities are truly staggering. Most graphics packages have groups of graph types that are compatible—perhaps four or five in a group are interchangeable. This means that you can view your data as a bar or pie chart. Compare that with 32 three-dimensional charts from an almost infinite number of angles, plus 15 two-dimensional charts—all of them graphed from the same data set in seconds.

*Perspective's* menu system offers easy customization: you can change the location and the size of titles, adjust patterns and line style, switch the order in which the data is presented, position the image on paper for printing, and select many other choices. The company offers free telephone support to help you if necessary.

*Perspective* is not without shortcom-

ings, though. In addition to its lack of color, it supports only dot matrix and laser printers, not plotters (it does, however, support EGA monitors). You can import data only through DIF, SYLK, and ASCII files. The program doesn't cover many popular business graphs, such as high/low and organization charts. Also, you have only limited control over the amount of annotation you can include on a chart.

Yet the greatest disadvantage is that *Perspective* is so much fun, you may never get any work done.

## Freelance

You can jazz up your *Graphwriter* chart, though. Simply import it into *Freelance*, also from Lotus Development Corp.

When *Freelance* was introduced in 1985, it created a stir. At last you could take your Lotus .PIC files and make something fancy out of them. And you could also use the programs to lift a *Graphwriter* chart onto another plateau. *Freelance* provides a library of drawings and borders, which you can rotate or flip, left to right or top to bottom. It supports mice, too.

*Freelance Plus* offers even more fea-



### FACT FILE



#### Freelance, Version 1.0

Lotus Development Corp.  
55 Cambridge Pkwy.,  
Cambridge, MA 02142  
(800) 345-1043

List Price: \$395  
Requires: 256K RAM;

two disk drives; a graphics card; a printer with graphics capability, a plotter, or a film recorder.

In Short: A program that enhances *Graphwriter*, 1-2-3, or *Symphony* graphs by adding illustrations and altering or moving elements, and creates images that can be tilted or flipped for special effects. Not copy protected.

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tures (see the First Looks section in this issue of *PC Magazine*). While the original version may provide all the ornamentation you'll ever need for your graphs, it isn't very good at creating an ordinary graph of your data from scratch. You'd make a bar chart, for instance, by copying rectangles onto your screen and then stretching them to approximate the values for your data.

The screenshot shows the *Freelance* software interface. The menu bar includes Add, Select, Edit, Move, Rearrange, View, Options, File, Plot, Help, Done, Copy, Replicate, Delete, Undo, Turn, Flip, Priority, Join, Lock, and Symbol. The workspace displays a grid of symbols under the heading "Flashes". The symbols include various shapes like sunbursts, speech bubbles, and arrows. One sunburst symbol at the top center is highlighted. To the right of the workspace is a vertical panel titled "SYMBOL" containing a list of symbols with their coordinates (X, Y) and file names. The symbols listed are: X: 5.93, Y: 6.37, [FLASHES 1], Page : 2, Free : 38.7K, HLT, LOCK, and MENU.

In *Freelance*, illustrations must be loaded onto page 2 of the work screen in sets. In this example the sunburst symbol at the top center of the screen has been selected from the *Flashes* set for transfer to page 1, where it can be added to a graph.

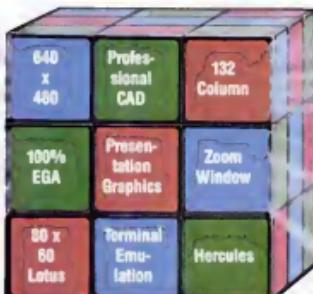
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PC Magazine—Oct. 28, 1986

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*Freelance exhibits its strengths here. Objects can be copied, tilted, and superimposed on one another with dramatic effect.*

*Freelance Plus* really shines when embellishing your 1-2-3 and *Symphony* graphs. In fact, even the menu structure was designed to make Lotus spreadsheet users feel right at home. The opening menu consists of a line at the top of the screen that says Add, Select, Edit, Move, Rearrange, View, Options, File, Plot, Help, and Done. As with the Lotus spreadsheets, when you move the cursor to one of those words, a brief explanation of the option appears on a second line under the menu. You select File Import to bring in either a Lotus .PIC graph or an ASCII text file for prettying-up. File Retrieve will bring back a *Freelance* chart stored previously or display its kissing cousin, a *Graphwriter* chart. Once the chart is displayed on your screen, the fun starts.

To spruce up your dull numbers with a lively drawing, you first look in the back of the manual, where the images that make up the library are shown. Each file has 10 or 20 symbols or illustrations.

Unfortunately, bringing in an image is an awkward process. First you press the PgDn key to switch to page 2 of your work area, which will probably be blank. If you've used the page previously, you'll have to choose View Clear to erase it. Then you pick File Retrieve to read in the file that contains the desired drawing. When it appears on the screen, you use Se-

## ■ When *Freelance* was introduced, it created a stir. At last you could take your Lotus .PIC files and make something fancy out of them.

lect One to activate the cell holding the artwork you want. The next step is Rearrange Copy, which causes a window consisting of white lines to be overlaid on the object in the cell.

Pressing the PgUp key returns you to the other page. You use the cursor arrows or a mouse to position the window where you want the drawing. Now you can size, color, or tilt it by following other menu options. You can also use Edit Fill to place a line pattern within any enclosed area.

To doll up a title, you choose Edit Text Face to change to a different type style. Those styles available aren't much different from the choices Lotus gives you for graphs, and different styles will not be

shown on your screen. (The style of the text on-screen never changes.) After you've picked Bold Italic, Triplex Roman, or whatever, you can use Edit Size to enlarge or reduce the text by pulling a window into the new shape you want.

If these tools seem limited to you, examine a few *Freelance* sample graphs, which show truly spectacular results. Some of the most dazzling ones, however, require more time to accomplish than usual business timetables permit.

Neither *Graphwriter* nor *Freelance* are copy protected in their present versions, although *Freelance* does include a routine that places the user's name and company affiliation on his copy of the product. Batch files handle the installation process for both programs. Technical support is free through Lotus and meets the company's high standards.

## Harvard Presentation Graphics

*Harvard Presentation Graphics* was developed by Software Publishing Corp., the folks who brought you the popular *PFS* series. The company acquired *Harvard Project Manager* and decided that the Harvard name would do very nicely for its new graphics program, too.

*Harvard Presentation Graphics* (HPG) has both the advantages and the limitations of a package designed primarily for ease of use. Experienced PC users will probably be able to run this program without even



### FACT FILE



**Harvard Presentation Graphics, Version A.01**  
Software Publishing Corp.  
P.O. Box 7210  
Mountain View, CA  
94039  
(415) 962-8910

List Price: \$395

Requires: 256K RAM; two disk drives; a graphics card; a printer with graphics capability; a plotter, or a film recorder.

In Short: An easy-to-use program that produces attractive standard graphs plus slide shows. Not copy protected.

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1. Front side touching the free page

2. Insert this sheet with

1. Open the foldout page

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Folded edge of the page

### Foldout slip-sheet

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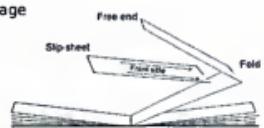
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1. Front side touching the free page

2. Arrow pointing to the fold

3. Slice the folded edge

4. Close the page and slip-sheet



1. Follow instructions on the other side

Inverted Back



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Back

1. Follow instructions on the other side

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## BUSINESS GRAPHICS



Choose function and options and press ENTER.

Text:

Fill: Yes Size: 5.5 Color: 1

F1-Help

F2-Preview Chart

F3-Attributes

F7-Text Adjust

F8-Exit Menu

You can use Harvard Presentation Graphics simply by following the menus. This screen shows the work area where graphs are customized. Using symbols to represent functions makes selecting options speedy.

looking at the excellent manual once.

Installing HPG is easy; all you have to know is that the latest version of the product is no longer copy protected and that an Install file sets up the program in the directory of your choice. A main menu choice leads you to a configuration menu, where you can specify the monitor you're using, your printer and/or plotter, the default border style you want around your charts (one option is none), and the default type style. Then you're ready to go to work.

Of course, you can enter data from the keyboard. You can also import it from an ASCII file or a Lotus spreadsheet file (from *I-2-3* or *Symphony*) by identifying the ranges you want. But the most exciting transfer alternatives are the direct importation of *PFS* graphs and graphs saved within a *I-2-3* or *Symphony* worksheet. (Two other programs reviewed here—Hewlett-Packard's *Charting Gallery* and Lotus's new *Freelance Plus*—will also import graphs from Lotus worksheets.)

Most Lotus spreadsheet users are accustomed to saving their graphs for printing with the PrintGraph utility. Graphs are saved to disk in files with the extension

.PIC. But HPG does not use .PIC files.

There's another way to save a graph in Lotus's *I-2-3* and *Symphony* programs: instead of making a .PIC file in your spreadsheet, you can also save your work as a named graph within the worksheet. HPG uses it in that form.

After you select the menu option to import a graph from a Lotus worksheet, you'll see a submenu listing the worksheets in your directory. After you choose one, you'll then see a second submenu, displaying the titles of all the named graphs contained in that file. Pick your graph by name, and it will be transferred in immediately, with data, labels, value ranges—everything you need. And you'll see your Lotus graph on the screen, ready for further enhancement. When you've finished working with your graph, you can save it as a "picture" in HPG and export it into a *PFS:Write* document.

**COSMETIC ENHANCEMENTS** What enhancements can you add to a Lotus graph? You can change the size and type of lettering, add borders around elements, move elements, and spice up their appear-

ance with arrows and bullets. In addition, you can draw lines with the help of the cursor keys. You accomplish these cosmetic changes in a work area that displays your graph next to an illustrated menu of editing options. Read the menu and follow your nose; it's hard to go wrong.

As for the possible types of graphs and charts you can produce, the usual line, bar, and pie charts are part of your arsenal. You can also combine these types on the same screen, using a pie, for example, to show general data, and a stacked bar to add detail on an exploded slice of the pie. Area charts and high/low/close charts are provided as well. Text charts include title pages, bullet lists, and column tables.

One of HPG's outstanding features is its slide-show menu, which enables you to select charts you've made and place them in the order you'd like for a presentation. You can even set the length of time you want each chart to be displayed on the screen. The next chart will be shown automatically at the end of the specified time or when you press any key.

As you make your selections for a show, you can also enter text notes for each chart that can be sent to your printer; you'll end up with crib notes or a script to read aloud to your audience—on paper, in the proper order, ready-to-use. Even if you rearrange the charts, the notes for an individual visual remain with that particular graph and will change sequence to match.

Even though *Harvard Presentation Graphics* doesn't give you *Graphwriter's* 23 kinds of charts, it's the kind of program busy executives love. Laser printers, film recorders, and the Polaroid Palette camera are all supported. Almost anyone can use it and create excellent graphics in a few minutes. And if there's a problem, free help is only a phone call away.

## Decision Graphics

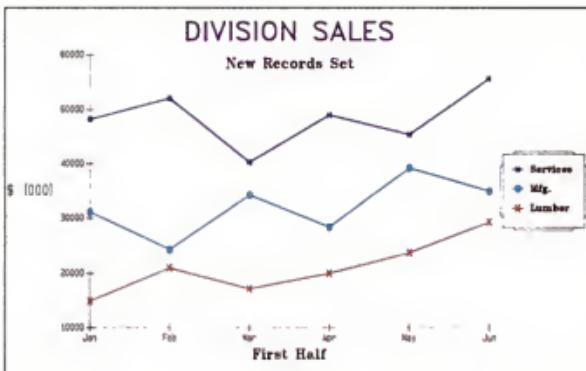
Samna Corp. is best known for its word processing software. It got into presentation graphics by acquiring the marketing rights to a graphics program from the French company Addo Marketing. The American version of the program is called *Decision Graphics*.

*Decision Graphics* still has some rough edges; in fact, some of the program files

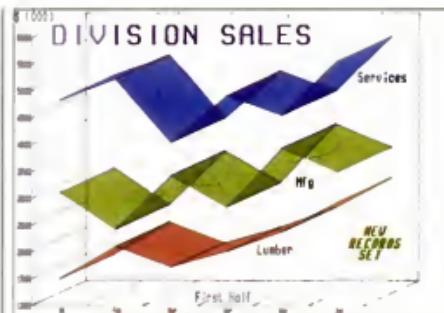


## DRESSING UP THE SALES REPORT

*The Microsoft Chart sample graph was designed to be as standard, attractive, and readable as possible. The organization is clear, the message obvious. Note that the elements include a main title, a subhead, a legend box, and labels for both the x and the y axes. A Hewlett-Packard 7475A plotter produced all the color graphs.*



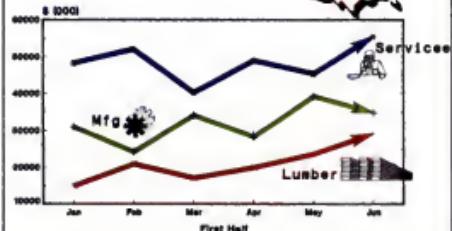
This graph is in one of the 32 standard 3-D formats that Perspective will deliver. Fifteen two-dimensional formats are also available. The image was rotated manually within the program so that the representation of the large figures for the Services Division, though most important, would not obscure the data points for the other divisions. The program is capable of rotating any chart 360 degrees on any of the three axes, providing hundreds of ways of looking at any set of information. The chart was reproduced on a Hewlett-Packard Laserjet Plus, because color and plotters are not supported.



If you have a little patience and a little programming knowledge, Sammi's *Decision Graphics* can produce striking line charts like this one featuring three-dimensional ribbons. If you are willing to spend time learning the macro language, you will be able to accomplish most of your graphics tasks by issuing a sequence of commands. You can also generate a graph almost instantly through menus once you have data ready. The default legend box is unnecessary because the program permits text anywhere on the screen to explain elements.

## DIVISION SALES

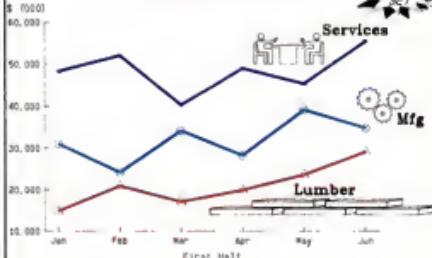
**NEW RECORDS SET**



This data was imported to *The Gallery Collection* as a 1-2-3 graph and then customized in a matter of minutes with the many options available. The quality of this package's library of illustrations is, in general, better than that of other programs. The stack of lumber is among the more than 1,000 images offered in the portfolios.

**DIVISION SALES**

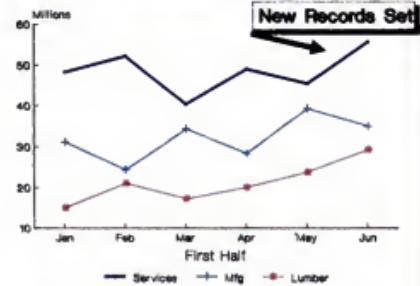
**NEW RECORDS SET**



This *Graphwriter* chart has been enhanced with *Freelance*. The functions of the three divisions are dramatized in an attention-getting fashion with illustrations from the *Freelance* library. The picture of lumber is actually a stack of boxes stretched sideways, since the library includes no drawing of lumber. Note that symbols have also reinforced the main title and the subhead.

## DIVISION SALES

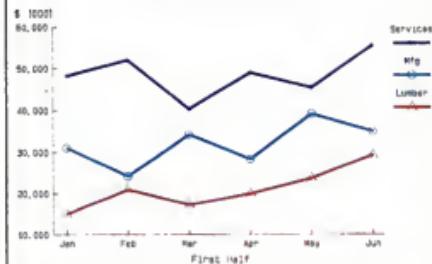
**New Records Set**



Although *Harvard Presentation Graphics* provides relatively few customization features, it does an excellent job of conveying information. You can add text boxes and arrows anywhere you want. The screen displays the type styles you chose.

## DIVISION SALES

**New Records Set**



It's hard to look like an amateur when you use *Graphwriter*. Each of the 23 graph types will be automatically centered and proportioned for output according to your data and customizing. This graph looks very much like the sample produced with *Microsoft Chart*.

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## ■ BUSINESS GRAPHICS



The Decision Graphics menus can be confusing at first. This screenshot shows the main menu, where data and macro files currently in memory are displayed in parallel columns. Although menus offer basic choices, you must enter many options in a special language on the command line at the bottom of the screen.

are still in French. Its output, however, is truly striking; it creates both two- and three-dimensional graphs and supports many printers and plotters, the Polaroid Palette camera, and several film recorders and video projectors. With the proper equipment, you can produce impressive output on several media, including paper, transparencies, and slides.

You can even create shows on your computer through a macro language; to do so, you simply program a series of graphs to display automatically or to change to the next image on command. If you're familiar with mainframe graphics programs, you'll feel right at home here. You can accomplish most tasks by issuing a sequence of commands. As a matter of fact, you must use the command language to implement many of the program's functions. To produce simple graphs, though, you can use the *Decision Graphics* menus to handle the job.

Installation is accomplished through a batch file that permits you to specify the drives and the directories you want to use both for the program files and for your data. You're asked to identify your type of

graphics card and monitor; then you can select both a printer and a plotter for regular use from a lengthy menu. You can change any of these items later through a simple option on the opening menu.

You can import data from DIF, SYLK,

**PC MAGAZINE**

**F A C T F I L E**

**Decision Graphics.**  
Version 2.0  
Samna Corp.  
2700 NE Expy.  
Atlanta, GA 30345  
(800) 831-9679  
(404) 321-5006  
List Price \$450

Requires: 256K RAM; two disk drives; a graphics card; a printer with graphics capability; a plotter; or a film recorder; DOS 2.1 or later.

In Short: Produces standard 2D graphs and outstanding 3D graphs; using some functions requires knowledge of command language, but commands and even presentations can be batched through macro capability. Not copy protected.

CIRCLE 666 ON READER SERVICE CARD

■ *Decision Graphics'* output is truly striking; it creates both two- and three-dimensional graphs and supports many printers and plotters.

or ASCII formats as well as from 1-2-3 and *Symphony* spreadsheets. To do so, you first define a procedure for the particular type of information. You must specify the directory, the path, and the name for the file to be imported; whether the data is in rows or columns; whether or not it's a time series; the exact columns or rows wanted; the location of the starting values in each series; the number of empty columns between each series; the starting year for time-series data; the initial period within the year; whether the information is weekly, monthly, or quarterly; and so on. If this sounds complicated, it is.

The good news is that you can write a macro so that you can load the same file later almost automatically, using your saved procedure. Of course, how helpful this capability will be depends on how often you'll want to import the same file.

Keyboard entry is much simpler, handled through the Load menu. You name your data series, give it a four-character abbreviation to be used in commands, stipulate the time periods you're using, if any, and enter the information. Each data series is entered in a separate file.

Once you have data to work with, you can generate a graph almost instantly. You use the Graph Options menu to select the type of graph you want (line, bar, pie, and so forth) and to tell the program whether you want a two- or three-dimensional rendering. You can hit the Return key to accept default settings for your options. As soon as you've entered the names of the data series you want depicted, you can

then view the graph on your screen.

A legend box will be centered at the top of the display showing which color or pattern goes with each data set. You can eliminate this box through the Graph Options menu or issue a command to change its size and location. Like many users, you may want a title centered where the program normally puts the legend box.

**CHANGING TYPEFACES** Your preliminary graph will include very little text, not even a title. You create titles by entering another submenu. You then use the cursor keys to move an arrow to the location where you want text to appear and start typing. Using function keys F6, F7, F8, F9, and F10 changes the style of the typeface, the color, the color of the background for the text, and the width and the height of the letters. Unfortunately, if you're using a plotter, you get output that resembles your screen only if you limit yourself to using the program's proportional typeface.

If you have a dot matrix or laser printer, you can use a variety of typefaces; but gray scale reproduction is poor, and so you'll have to be careful using contrast. An orange title on a blue background that looks pretty on-screen may end up as a black blob on paper.

After you're happy with the graph, you can save it as a Screen Image to print later. But don't try to load that screen image and send it to your plotter. On plotters, *Decision Graphics* can work only with graphs saved through Macro Memory, a different "save" choice that supposedly will remember and record all the keystrokes used in creating a graph on-screen. The version tested, however, did not always bring back stored graphs later for plotting. So the safest procedure is to plot the graph as soon as you've finished it, while it's still in RAM. Your data is saved in yet another area, called Data Memory. The options for saving your work to disk should be less confusing.

By the way, although the manual indicates that you can change the default serial port from COM1 to COM2, don't try to use your printer or plotter from a COM2 port. The copy of the program we tested recognized only COM1.

An interesting feature of the package is

its use of icons. Several symbols are provided, such as arrows, a male figure, a female figure, a tree, and even the Statue of Liberty. You can program the icons into a bar chart so that the bars are replaced by the symbols of your choice, all scaled automatically to fit the data.

Although *Decision Graphics* has a few bugs as noted, is sometimes awkward to use, and is not particularly friendly toward beginners, its output is among the best. Anyone with a little programming knowledge will appreciate its power and capabilities. The shortcomings are being corrected, and the services of a cheerful technical support group are available to registered owners without charge. These people were still learning the program when spot-checked for this article, but they should be very knowledgeable about it by the time you read this issue.

## Graphwriter

*Graphwriter* and its companion program, *Freelance*, were created by Graphic Communications, which was recently acquired by Lotus Development Corp. Both products have a fine reputation.

Complex, though relatively easy to use, *Graphwriter* comes on ten floppy disks packed with files. You simply answer

questions and follow menus to build any of its 23 professional-looking graphs.

You have to delve deeply into *Graphwriter*'s submenus, find the plotting option, and then wait many seconds to see a rough rendition of your graph on the screen. After you've used the package for a while, though, you'll have a mental image of how your graph will look. In fact, the program is so dependable and predictable that few of its users bother to preview their graphs.

*Graphwriter*'s real power is its ability to deliver almost any type of chart you could want. Give the program your data, and it'll calculate and draw a linear regression line; if you want to make that line exponential, logarithmic, or a power curve, just pick that menu option. How about a Gantt chart to graph your production schedules? It's there, along with bubble charts, range charts, and table charts. You can have your pie solo, in combination with other pies, or with a bar chart. Bar types include vertical, clustered vertical, horizontal, clustered horizontal, segmented, paired, grouped, and stacked.

You can increase the width of the bars until your bar chart becomes a histogram and then save the change as a new default. You can set up your own defaults for what *Graphwriter* calls its palettes, sets of col-

### Select Graphwriter Format

#### Basic Set

- 1. B010 - Column chart (vertical)
- 2. B011 - Bar chart (horizontal)
- 3. B020 - Segmented bars (vertical)
- 4. B021 - Segmented bars (horizontal)
- 5. B030 - Clustered bars (vertical)
- 6. B031 - Clustered bars (horizontal)
- 7. P010 - Pie chart (1-4 pies)
- 8. L010 - Line chart
- 9. S010 - Scatter plot (regression)
- 10. C010 - Bar-Line combination
- 11. T010 - Text/Word chart
- 12. - Unused

#### Extension Set

- 13. S020 - Gantt chart
- 14. S030 - Organization chart
- 15. S040 - Bubble chart
- 16. S050 - Table chart
- 17. C020 - Pie-Bar combination
- 18. L020 - Surface Line chart
- 19. L030 - Line-Table chart
- 20. S022 - Double stacked bars
- 21. S032 - Grouped bars
- 22. S040 - Range chart (bars)
- 23. S050 - Paired bars
- 24. S060 - Horiz. bars (inset labels)

#### Select one:

This Graphwriter submenu lists the charts. Even with the wealth of types offered, there's no high/low chart. Data can be transferred between some compatible formats.

# Once upon a midday dreary, While I pondered, weak and teary, How to find some missing theory, For my micro to restore;

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★ THE WORD 3.1 (NIV Bible) .....	159

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✓ Turbo Database Toolbox 1.2 .....	41
✓ Turbo Graphics Toolbox 1.0 .....	41

### Turbo Editor Toolbox 1.0 .....

✓ Turbo Editor 1.0 .....	41
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### Turbo Newpack (Frameworks and Editor) .....

✓ Turbo Lightning 1.0 .....	59
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### Word Wizard 1.1 .....

✓ Turbo Pascal 3.0 w/BCD & 8087 support .....	75
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### Turbo Pascal w/Turbo Tutor .....

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### Turbo Family Jumbo Pack .....

✓ Sidekick 1.5 .....	187
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### Traveling Sidekick 1.0 .....

✓ Traveling Sidekick w/Sidekick .....	43
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### Reflex 1.1 .....

✓ Reflex Workshop 1.1 .....	41
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### Superkey 1.1 .....

✓ Superkey/Sidekick Package .....	41
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259

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259

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85

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### Microsoft Project 3.0 .....

197

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197

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* - Wines on Disk .....	25.	* - Math Plan 2.1 .....	89.
* - VP-Planner 1.0 .....	57.	* - WordPerfect 4.2 (one of the highest rated word	
* - VP-Info 1.0 .....	54.	processors) .....	239.
Personics (not copy-protected)			
* - SmartNotes 1.0 .....	49.		
Peter Norton (not copy-protected)			
* - Norton Commander 1.0 .....	36.		
* - Norton Utilities 3.1 .....	59.		
Powerbase (not copy-protected)			
* - Powerbase 2.2 .....	189.		
Quarterdeck (not copy-protected)			
- DESQView 1.3 .....	65.		
Silents On-Line			
* - Smart Money 1.0 .....	49.		
Simon & Schuster (not copy-protected)			
* - Webster's New World Speller 1.3 .....	39.		
* - Webster's New World Thesaurus 1.0 .....	43.		
* - Webster's New World Writer 1.01 (includes			
Thesaurus & Speller) .....	109.		
Softlogic Solutions (copy-protected)			
* - Double DOS vers. V (PC concurrency) .....	33.		
* - Software Cerouso 1.5 (PC multitasking) .....	33.		
* - Disk Optimizer vers. 1.5 .....	35.		
Software Group (not copy-protected)			
* - Enable 1.1 .....	call		
Software Publishing (not copy-protected)			
* - PFS First Choice 1.0 (includes word processor, spreadsheet, database, communications) .....	89.		
* - Professional Write 1.0 .....	119.		
* - Personal Publisher 1.0 .....	109.		
* - Professional Fax 1.0 .....	149.		
* - Harvard Presentation Graphics A-01 .....	245.		
* - Harvard Total Project Manager 1.12 .....	289.		
Softstyle (not copy-protected)			
* - Printworks Dot Matrix 1.05 .....	39.		
* - Printworks Laser 2.12 (use your Laser printer for everyday work) .....	69.		
		ATI (copy-protected)	
		* - SKILL BUILDER PROGRAMS	
		Intro and How to Use:	
		PC-DOS MS-DOS	
		Compaq Typing Tutor	
		IBM-PC BASIC .....	each 33.
		* - TRAINING POWER PROGRAMS	
		How to Use:	
		Lotus 1-2-3 Wordperfect dBase III Plus	
		WordStar Displaywrite 3 R:base 5000	
		Multimate Advantage	
		Symphony .....	each 43.
		Individual Software (copy-protected)	
		* - The Instructor II .....	26.
		* - Professor DOS .....	33.
		* - Tutorial Set (both items above) .....	49.
		* - Typing Instructor II .....	26.
		* - Training for Lotus 1-2-3 (for vers. 1A & 2) .....	37.
		* - Training for dBase III .....	37.
		* - Training for Project Management .....	37.
		Microsoft (not copy-protected)	
		* - Learning DOS (for any version) .....	33.
		Bliss Chip	
		Realistic financial simulations.	
		* - American Dream .....	36.
		* - Baron .....	36.
		* - Millionaire .....	36.
		* - Square .....	36.
		* - Tycoon .....	36.

1-800/243-8088



PC Connection

6 Mill Street 315M

Marlow, NH 03456

603/446-3383

For the IBM-PC (XT & AT) Exclusively.

# PC CONNECTION®

# Could it be some help from nearby,

Entering my frantic sphere by  
Showing right before my clear eye,  
Basics of computer lore?

## Broderbund (reqs. CGA)

* Lode Runner	\$22.
* Championship Lode Runner	22.
* Ancient Art of War	27.
* Breakers (txt game)	29.
* Toy Shop	39.

## CBS

* Murder by the Dozen	17.
Electronic Arts (reqs. CGA)	
* Pinball Construction Set	17.
* Music Construction Set	17.
* Dr. J Larry Bird One-on-One	17.
* Starflight	32.
Friendlysoft (not copy-protected)	
* PC Arcade (10 games)	35.

## Funtastic (reqs. CGA)

Great arcade style games	
* Big Top	27.
* Cosmic Crusader	27.
* Master Miner	27.
* Snack Attack II	27.

## Hayden Software

* Sargon III (highest rated Chess program)	32.
Infocom (not copy-protected)	
Sophisticated interactive fiction	
Difficulty levels shown in italics	
* STANDARD	

* Enchanter	* The Witness	* Planetfall
* Cutthroat	* Wishbringer	* Zork I
* Ballyhoo	Footloose	
* Hitchhiker's Guide		each 24.
* ADVANCED		

## Zork II

## Zork III

## Sorcerer

## A Mind Forever Voyaging

## each 27.

## EXPERT

## Spellbreaker

## 

## Invisibles (hint booklets)

## Specify game

## Microleague Sports (reqs. CGA)

## \* Microleague Baseball

## Microprose (reqs. CGA)

## \* F-15 Strike Eagle

## \* Silent Service (WWII submarine in the South Pacific)

## \* Hellcat Ace

## \* Spitfire Ace

## \* Solo Flight

## Microsoft (reqs. graphics brd.)

## \* Flight Simulator 2.12

## Mindscape (reqs. graphics brd.)

## \* Balance of Power (avoid nuclear war)

## 1Step Software (reqs. CGA)

## \* Golf's Best (Pinehurst)

## \* Golf's Best (St. Andrew's)

## Origin Systems (reqs. CGA)

## \* Ultima 3

## Parlor Software (not copy-protected)

## \* Bridge Parlor (best Bridge simulation)

## PC Connection Hardware Special

through December 31, 1986

## NTR (No Tools Required) Workstation Furniture

Great. You bought this incredible \$8,000 computer complete with printer, monitor, all kinds of documentation, and other stuff. But now that you're home, what do you put it all on? Well, you could take over the kitchen table, set up a couple of TV trays in the den, or do the easy way. Give us a call.

- Desk measures 36" W x 29" D x 28" H, adjustable legs for uneven floors
- Made of highest quality steel, with laminated 1 1/4" thick tabletop (available in oak, teak, or walnut finishes)
- Heavy-duty construction, crafted to the specifications of a major American computer manufacturer
- Large, integral shelf for storing paper, manuals, and other materials
- No Tools Required for assembly; precision snap-fit components

For any computer \$99.

## PCSoftware (not copy-protected)

* Championship Blackjack	25.
* Armchair Quarterback	25.
* Chess 2001	25.
* Championship Backgammon	26.
* Sierra On-Line (reqs. CGA)	
* Championship Boxing	24.
* Black Cauldron	25.
* Space Quest	32.
* King's Quest	33.
* King's Quest II	33.
* King's Quest III	32.
* Simon & Schuster	27.
* Star Trek Kobayashi	27.
* Sir-Tech	36.
* Wizardry	45.
* Spectrum Holobyte (reqs. CGA)	
* Orbiter (Shuttle simulator)	27.
* GATO	27.
* Telstar 2 (search the skies)	45.
* Sublogic (reqs. graphics brd.)	
* Night Mission Pinball	29.
* Jet	15.
* Scenery (airport) disks for Jet	each 15.
* Japan Scenery Disk	15.

* Star Scenery Disk—San Francisco	\$15.
* Package of all 6 Western Airports	69.
* XOR (not copy-protected)	

\* NFL Challenge (be the coach)

## HARDWARE

Manufacturer's minimum limited warranty period is listed after each company name. Some products in their line may have longer warranty periods.

## AST Research ... 2 years

I/O Plus II/C	119.
Second serial, parallel or game port	35.
SixPakPlus 384k C/S/P includes Sidekick vers.	
1.5 not copy-protected & DESQView	169.
SixPakPlus 384k (fully populated)	209.

SixPakPremium 256k C/S/P	
upgrades to 1 Meg on board, 2 Meg w/ opt. piggyback board; EEMS compatible, includes DESQView	319.
SixPakPremium Piggyback Board 256k	189.
FastDisk (accelerator board)	369.
Advantage 128k upgradeable to 1.5 Meg	

includes Sidekick version 1.5 not copy-protected and DESQView	369.
Advantage Premium 512k S/P	
upgrades to 1 Meg on board, 2 Meg w/ opt. piggyback board; EEMS compatible, includes DESQView	469.
Advantage Premium Piggyback Board 512k	289.
3780	579.

5251-11	579.
5251-11 Plus	639.
RAMPAGE 256k upgrades to 2Mb	call
RAMPAGE AT 512k upgrades to 2Mb	call
Both RAMPAGE boards support EMS and fully support EEMS, and include DESQView	

Amdek ... 2 years	
Video 310A mono monitor (amber)	159.
* Color 600 - RGB	399.
* Color 722 - EGA compatible	519.
Compucable ... lifetime	

Plastic Keyboard & Drive Cover Set	15.
IBM Mono Screen Enhancement	17.
9-to-25 Pin Serial Converter cable	19.
AT-to-Smartmodem cable	19.
15-foot Parallel cable	27.

DATA TRANSFER SWITCHES (A-B switch boxes)	
* 2-Position	39.
* 3-Position	65.
* 4-Position	79.
Cquests ... 1 year	

Uninterruptible power backup units	
Datasaver 200 Watt	call
Datasaver 400 Watt	call

For the IBM-PC (XT & AT) Exclusively.

**PC CONNECTION®**

# "If it's PC help you're needing,

For assistance you are pleading,  
 Check the magazine you're reading;  
 Solve your problems evermore."

## Curtis ... Lifetime

### ACCESSORIES

• Low Profile Tit and Swivel Pedestal	\$25.
- PC Pedestal (for IBM Mono or Color)	27.
- Static Mat	27.
- Portable Pedestal (for portable computers)	36.
- Printer Stand	18.
- System Stand (for IBM-PC & XT)	19.
- Universal System Stand	25.
* Crystal 150 Watt (line conditioner)	123.
* Crystal 300 Watt (line conditioner)	159.

### CABLES

Smartmodem-to-IBM Cable	17.
Keyboard Extension Cable (30 ft. 9 feet)	27.
Extension Cables for IBM Mono Display	33.
Color and Monochrome Extension cables	39.
Printer-to-IBM cable	17.

### SURGE SUPPRESSORS

* Safesafe (6 outlets)	21.
* Diamond (6 outlets)	29.
* Diamond-Plus (w/FAX & modem protection)	41.
* Emerald (6 outlets; 6 ft cord)	36.
* Sapphire (3 outlets; EM/FI filtered)	47.
* Ruby (6 outlets; EM/FI filtered; 6 ft cord)	55.
* Ruby-Plus (w/FAX & modem protection)	65.

### Command Center - SPECIAL

DCA ... 1 year	79.
- Smart Alex (5251 emulation board)	639.
- Irma (3270 emulation board)	639.
- Irma Keyboard	259.
Epson ... 1 year	

* EX-800 printer (90 col., 300 cps)	499.
* EX-1000 printer (136 col., 300 cps)	699.
* FX-85 printer (80 col., 180 cps)	379.
* FX-286 printer (136 col., 200 cps)	529.
* LX-86 printer (80 col., 120 cps)	245.
* LO-800 printer (80 col., 180 cps)	549.
* LO-1000 printer (136 col., 180 cps)	749.
* LO-2500 printer (136 col., 324 cps)	1089.
* 4201 printer (136 col., 420 cps)	call

### Printer-to-IBM cable

Everex ... 1 year	15.
- Evercom II 1200 Baud Internal modem (half card, w/software)	137.
5th Generation ... 6 months	
* Logical Connection Print Buffer 256k	call
FTG ... 2 years	

### Light Pen

- Demo Disk for Light Pen	195.
Hayes ... 2 years	39.
* Smartmodem 300	139.
- Smartmodem 1200	389.
- Smartmodem 1200B (w/Smartcom II)	349.
- Smartmodem 1200B (no software)	319.
* Smartmodem 2400	589.
- Smartmodem 2400B (w/Smartcom II)	529.
- Smartcom II 2.1 (software)	89.

## Transit 1000 ..... \$279.

## N\* cables for Transit 1000 ..... each 16.

All Hercules boards come with parallel port and FREE parallel printer cable.

## Hercules ... 2 years

All Hercules boards come with parallel port and FREE parallel printer cable.

## Hercules Color Card ..... 159.

## Hercules Graphics Card ..... 189.

## Hercules Graphics Card Plus ..... call

## Graph X Software ..... 42.

Intel ... boards: 5 years; chips: 1 year

Above Board PC 64k (upgrades to 2 Meg)

Above Board PS-PC C/S/P (upgrades to 1.5

Meg)

Above Board PS-AT S/P (upgrades to 1.5 Meg or

higher w/ribbon/back)

8087 (for IBM-PC & XT)

8087-2 (for 8 MHz computers)

8087-4 (for 8 MHz AT & XT 265)

8087-8 (for 10 MHz & faster IBM-PC AT)

Masterpiece ..... 94.

Masterpiece Plus ..... 129.

Primer/portable computer stand ..... 17.

key tronic ... 90 days

5150 keyboard ..... 115.

5151 keyboard (deluxe) ..... 169.

5153 keyboard with touch pad ..... 279.

Kraft ... 1 year

Joystick (2 button) ..... 27.

Joystick Adapter Card ..... 29.

New 3 Button Joystick ..... 33.

Executive Cursor Control 2.0 w/joystick ..... 37.

Guru Port for AST SuPak/SuPak Premium ..... 25.

Microsoft ... 1 year

Microsoft Bus Mouse with software 6.0 ..... 127.

Microsoft Serial Mouse with software 6.0 ..... 135.

Mach 10 (accelerator board) ..... 369.

Mouse Systems ... Lifetime

Junior Mouse with PC Paint 2.8 (connects directly

to PC/serial port) ..... 99.

PC Mouse with PC Paint+ ..... 127.

Bus Mouse w/PC Paint+ ..... 129.

PC Mouse with Dr. Halo II ..... 139.

PC Mouse with Ready and PC Paint+ ..... 149.

NEC ... 2 years

Mutisync monitor (EGA compatible) ..... call

## NSI Logic ... 3 years

EPIC (video adapter, EGA compatible) ..... \$279.

Small EGA ..... 299.

## Orchid Technologies ... 1 to 2 years

Conquest Multifunction Board (16k upgrade to

to 2Mb, fully supports EMS spec.) ..... 264.

Eccell Multifunction Board for the AT ..... 399.

Tiny Turbo 265 ..... 445.

PC Turbo 266s w/1 Meg ..... 739.

PC Turbo 280s Ram Daughterboard 1 Meg ..... 269.

Turbo EGA ..... 589.

EGA ..... 269.

## Princeton Graphics ... 1 year

Text (green or amber) switch for HX-12 ..... 22.

MAX-12E Ambar monochrome monitor ..... 179.

HX-12 RGB monitor (690 x 240) ..... 449.

HX-12E (EGA compatible) ..... 539.

## Quadrant ... 1 to 2 years

Quadcolor 1 (standard CGA card) ..... 99.

Expanded Quadboard

0k (upgrades to 384k) ..... 129.

384k (fully populated) ..... 179.

Microtizer Printer buffer 64k (parallel) ..... 159.

Microtizer II Printer buffer 64k (expandable to

512k, selectable input/output modes) ..... 249.

QuadEGA (half-card) ..... 349.

## SMA ... 30-day money-back guarantee

PC-Document Keyboard Templates available for:

DOS/Basic 3.0-3.1 ..... WordStar

Lotus 1-2-3 ..... WordStar 2000

Symphony ..... MultiMate

Framework ..... WordPerfect

dBase III ..... each 12.

Some templates also available for Keytronics keyboards.

## Toshiba ... 1 year

Toshiba printers are 24 pin dot matrix:

P321 S/P printer (60 column, 216 cps) ..... 519.

P351 S/P printer (126 column, 288 cps) ..... 1049.

Toshiba T1100 PLUS Laptop Computer ..... call

Toshiba T3100 Laptop Computer ..... call

Teac Labs ... 1 year

EVA (EGA card) ..... 317.

EVA 480 (supports 640x480 resolution, includes drivers for Lotus 1-2-3 ver. 1A) ..... 399.

Video 7 ... 2 years

VEGA (half-card) ..... 329.

VEGA Deluxe (w/FREE Microsoft Windows) ..... 399.

## DRIVES

### i2 Interface ... 1 year

20 Meg Hard Drive Card (85 ms) ..... 459.

### 10MEGA ... 90 days

Bernoulli Box 20 Meg w/PC2 card ..... call

10 Meg cartridge

**1-800/243-8088**

### PC Connection

6 Mill Street  
Marlow, NH 03456  
603/446-3383



For the IBM-PC (XT & AT) Exclusively.

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# Just one toll-free call to Marlow,

Experts there will end your sorrow."  
 "So my brow will no more furrow?"  
 Quoth the maven, "Nevermore."

Bernoulli Box 40 Meg w/PC2 card	call
Bernoulli Plus (Two 20 Meg Bernoulli Drives w/80 Meg Winchester; includes PC2W card)	3799.
With PC 2BW Bootable Card	3859.
PC2B (Bootable) Card	229.
20 Meg cartridge	67.
Bernoulli Box Care Kit	79.
<b>Mountain Computer</b> ... 1 year	
Drive Card 20 Meg (80 ms.)	call
Drive Card 30 Meg (78 ms.)	call

<b>Seagate</b> ... 1 year	
20 Meg Internal Hard Drive (w/controller and cables, 65 ms.)	389.
20 Meg Internal Hard Drive (w/Western Digital controller and cables, 65 ms.)	409.
-20 Meg Internal Hard Drive for AT (40 ms.)	569.
-30 Meg Internal Hard Drive for AT (40 ms.)	589.

<b>Tandon</b> ... 1 year	
New Business Card 20 Meg (85 ms.)	409.
<b>TEAC</b> ... 1 year	
PC, XT 360K Drive (5 1/4" half-height, FD-558V)	109.

<b>Toshiba</b> ... 1 year	
PC, XT 360K Drive (5 1/4" half-height)	109.
-AT 360K Drive (5 1/4" half-height)	117.
External Drive 5 1/4" for Toshiba Laptops	call
Floppy Link for Toshiba Laptops	call

<b>Western Digital</b> ... 1 year	
File Card 20 Meg (w/XTREE, 80 ms.)	call

## MEMORY

64k Memory Upgrade Set for IBM-PC or XT system board or any memory board	
150 nanoseconds (set of 9)	15.
-128k Memory Upgrade Set for IBM-AT System Board (9 chips piggybacked)	39.
-256k Memory Upgrade Set for any IBM-AT memory board (9 chips)	39.

## DISKS

All disks have a lifetime warranty.	
<b>DS/DD Disks</b> for the PC & XT (40 TPI).	
-Fuj (10 disks per box)	27.
-Verbatim (10 disks per box)	29.
-Maxell MD-2 (10 disks per box)	34.
<b>DS/High Density Disks</b> for the AT (96 TPI).	
-Fuj (10 disks per box)	27.
-Verbatim (10 disks per box)	29.
-Maxell (10 disks per box)	34.
<b>3 1/2" Double-sided Diskettes</b> (720k)	
Verbatim (10 diskettes)	26.
Sony (10 diskettes)	26.
MAXELL (10 diskettes)	26.
3M (10 diskettes)	27.
BASF (5 diskettes)	14.

## PC Connection Service Center

Did you know that we are an authorized Epson and IOMEGA service center? We typically offer twenty-four hour turnaround on serviced items. Our labor charge is only \$25 per hour. Call 1-800-PCC-TECH extension 138 for a free telephone diagnosis.

## Junior Happiness

Christmas comes but once a year so our Jr. Specials now are here bringing joy to Juniors far and near

\*Jr. Drive Kit (includes Creative Firmware Drive II A adapter, power supply and Control Data Floppy Drive) \$199.

## ALPHA SOFTWARE

\*Jr. Electric Desk (includes word processor, database, spreadsheet, communications on 2 cartridges, one program disk and one tutorial disk) \$69.

## MOUSE SYSTEMS

\*Jr. Mouse w/PC Paint 2.8 (w/software and pad, reqs. 256k) \$99.

## FINANCIAL SOFTWARE

\*Jr. Financier (reqs. IBM BASIC cartridge) \$19.

## KEYTRONIC

\*Jr. 5151 Deluxe Keyboard \$169.

## INFORMATION SERVICES

*Compuserve Information Service (includes subscription, manual, \$25 usage credit, monthly publications)	24.
*Dow Jones Membership Kit	24.
*The Source	30.

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6 Mill Street  
Marlow, NH 03456  
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For the IBM-PC (XT & AT) exclusively.

## MISCELLANEOUS

Automation Facilities	
-Floppiene Disk Drive Cleaner	\$18.
Environmental Software	
-Nylon Computer Covers PC, XT or AT (navy, burgundy or silver)	20.
Innovative Concepts	
*Flip n' File 50 (holds 50 disks)	16.
*Flip Sort (holds 70 disks)	15.
Kalmar	
-Teakwood Disk Holder (holds 50)	19.
-Teakwood Disk Holder (holds 100)	29.
PC Connection	
Computer Toolkit (all the tools you need to go with your PC in a software style binder; great gift ideal)	29.
Clear Hard Plastic Keyboard Cover and Copy Holder (PC & XT)	16.

## OUR POLICY

- We accept VISA and MASTERCARD.
- No surcharge added for charge orders.
- Your card is not charged until we ship.
- If we must ship a partial order, we never charge freight on the shipment(s) that complete the order.
- No sales tax.
- All U.S. shipments insured; no additional charge.
- AP/OFFO orders usually shipped 1st Class Mail.
- Allow 1 week for personal and company checks to clear.
- UPS Next-Day-Air available.
- COD max: \$1000. Cash or certified check.
- 120 day limited warranty on all products.\*
- To order, call us anytime Monday thru Friday 9:00 to 9:00, or Saturday 9:00 to 5:30. You can call our business offices at 603/446-3383 Monday through Friday 9:00 to 5:30.

## SHIPPING

**Note:** Accounts on net terms pay actual shipping.  
**Continental US:** For monitors, printers, and  
floppy drives, add 2% for UPS ground shipping.  
 For computers and Bernoulli Boxes, pay actual  
UPS charges. Call for UPS Blue or UPS  
Next-Day-Air. For all other items, add \$2 per  
order to cover UPS shipping. We will automatically  
use UPS 2nd-Day-Air at no extra charge if you are  
more than 2 days from us by UPS ground.  
**Hawaii:** For monitors, printers, and drives, actual  
UPS Blue charge will be added. For all other  
items, add \$2 per order. **Alaska and outside  
Continental US:** Call 603/446-3383 for  
information.

CIRCLE 339 ON READER SERVICE CARD

# PC CONNECTION®

\*DEFECTIVE SOFTWARE REPLACED IMMEDIATELY. DEFECTIVE HARDWARE REPLACED OR REPAIRED AT OUR DISCRETION. SOME ITEMS HAVE MANUFACTURER'S WARRANTIES UP TO FIVE YEARS.



# PC Puzzle.

## Putting the PC's together again.

In the enigmatic town of Marlow, NH (pop. 544), there's nothing we like better than a good fit. Fields and streams. Peaches and cream. You and your lean mean micro machine.

In the old days, putting together a PC system was child's play. But now there are thousands of programs and peripherals to choose from, and it takes experience to find a perfect match. Other companies might try to solve your PC puzzle by shoving in any old component. We always take the time to find the right pieces for your applications, your budget, and your existing system.

## Get the picture?

You see, there's no point in buying a board without the bytes to boot it. Or a printer without a port to

prompt it. Or a game without the graphics to grab it.

There's a solution to all these PC puzzles, but you have to see the whole picture—and we're in the perfect position to do it. Because we've helped hundreds of thousands of PC users piece their systems together.

## See the Connection?

Since we spend all day helping you solve your

PC puzzles, we thought you might enjoy spending some leisure time solving ours. So we're offering a free 1000 piece PC Connection jigsaw puzzle to anyone who places a \$500 order between now and November 31.

Just call 1-800/243-8088 or 1-603/446-3383, M-F 9:00 to 9:00; Saturday to 5:30. If you're planning to visit, call ahead to make sure what you want is in stock.



The PC Connection puzzle, featuring our confounding little assets in one of their most famous poses. Suitable for beginners and advanced puzzlers. Offer not available to net accounts. Limit one per customer.

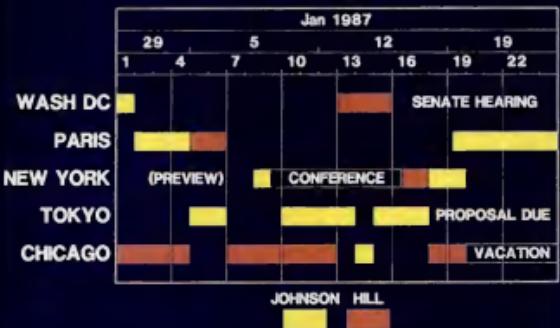
For the IBM-PC (XT & AT) exclusively.

# PC CONNECTION

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## ■ BUSINESS GRAPHICS

### BASED ON THIS SCHEDULE A CORPORATE JET IS ESSENTIAL



A range chart, one of a wide variety available, shows that Graphwriter has the power to impress without further enhancement in Freelance.

ors, patterns, and markers that you can select for automatic use in a chart. You can configure the program, for example, so that on a vertical bar chart the first bar plotted will always be blue and the second always red. The program has symbol sets for organization charts; you can change the symbols' default size, shape, and colors and the default type styles and sizes.

Yet *Graphwriter* is an "elderly" program, with little updating in recent years. It will import data in DIF or SYLK formats, but that's all. You can't drag elements around with a mouse and position them wherever you want them. It offers no fancy illustrations that you can drop in and size to adorn your charts. And don't expect any wild three-dimensional graphics, either. *Graphwriter* does produce elegant, standard work, with output to popular printers, plotters, and the Polaroid Palette camera for slides.

**FACT FILE**



**Graphwriter,**  
Version 4.3  
Lotus Development  
Corp.  
55 Cambridge Pkwy.  
Cambridge, MA 02142  
(800) 345-1043  
List Price: \$495

**Requires:** 256K RAM, two disk drives; graphics card; a printer with graphics capability; a plotter, or a film recorder

**In Short:** A time-honored, menu-driven program that produces 23 graph types of professional quality; its ten disks make it not so practical on a floppy disk system. Not copy protected.

CIRCLE 564 ON READER SERVICE CARD

■ *The Gallery Collection* places more than 1,000 high-quality symbols, formats, and illustrations at your disposal, including two optional portfolios that cost \$95 each. (Additional portfolios are in production.) You get 15 different type styles, with more in the optional portfolios, and they're all shown on your screen just as you'll see them on paper. Of course, you can create many more typefaces by widening or lengthening any of the existing fonts, and you can expand or shrink them to any size you want and display them in any color. If you print in black and white, the program simulates the gray scale for you. In other words, it uses patterns to give the appearance of gray.

then *Drawing Gallery* to customize it.

*The Gallery Collection* places more than 1,000 high-quality symbols, formats, and illustrations at your disposal, including two optional portfolios that cost \$95 each. (Additional portfolios are in production.) You get 15 different type styles, with more in the optional portfolios, and they're all shown on your screen just as you'll see them on paper. Of course, you can create many more typefaces by widening or lengthening any of the existing fonts, and you can expand or shrink them to any size you want and display them in any color. If you print in black and white, the program simulates the gray scale for you. In other words, it uses patterns to give the appearance of gray.

*The Gallery Collection* interfaces directly with Hewlett-Packard's *Executive MemoMaker*, a nifty office word processor. Through this interface you can pop a graph you make with the *The Gallery Collection* right into your next letter or report.

The real beauty of the package, however, is its user interface. Using the required mouse means that creating a beautiful custom chart takes only a few minutes. Here's an example: First, as with *Harvard Presentation Graphics*, you can import a graph from a Lotus spreadsheet by selecting a menu option in *Charting Gallery*. It will appear on your screen almost instantly; the data supporting the graph will have been transferred too. Next, you save the graph as a Picture file so that you can work on it in *Drawing Gallery*. You then go into the Drawing module.

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## BUSINESS GRAPHICS

To do anything with the elements you see on your monitor, you must first activate one or more of them by moving the mouse pointer to the object in question and clicking the mouse's left button. Or you can "lasso" one or more elements by enclosing them in an expandable frame that appears if you hold the button down; you then release the button when the object is in the frame.

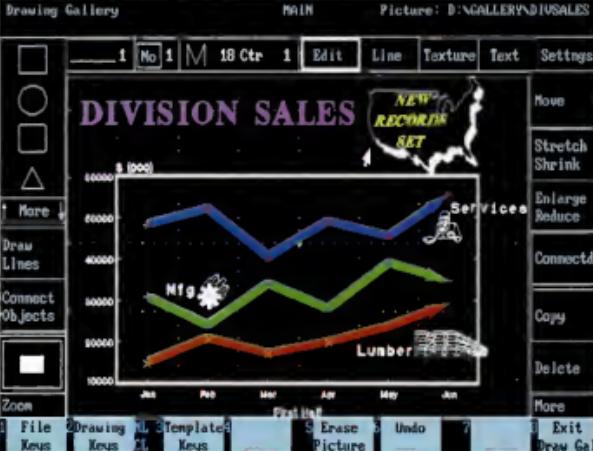
This target element becomes surrounded with square white "handles." You can change its shape, color, position, or whatever by moving the mouse pointer to the appropriate option on a menu that encircles the entire work area and then clicking the mouse again. If the object is a line of type, you can select a different type style in the same manner. When you're ready to deactivate the object you've modified, all you have to do is move the mouse pointer into an empty spot in the display and click the button again.

**ADD A PICTURE** Let's say you want to add a picture to your graph. Use the mouse to choose "add a picture" from the menu. You'll be prompted to "make a box to de-

fine the area where you will add a picture." You hold down the mouse's left button and move the mouse. You move the mouse to the place where you want the illustration. Another variable frame appears. Adjust the mouse slightly until the box is the size you want the picture to be and release the button. When you're asked for a filename, you type it in.

Each illustration in the library has its own descriptive name. If you can't remember the name, you can look it up in the catalog section of your manual, where all the pictures are shown and labeled. Or you can use the program's File Manager module to select the picture from a directory. The picture appears on your graph in the exact size and position of the box you made. Naturally, you can stretch the drawing, color it, or move it once it's on your screen. The entire process takes less time to complete than it does to describe.

You can choose a colored, textured background and with one mouse click place it behind all the other objects on the screen. You can call up prefab formats for calendars, schedules, and accounting purposes. You can copy objects, match the



The Gallery Collection work area is surrounded by menu options. Function keys activate the ones at the bottom of the screen. Activating the others requires using a mouse. Illustrations may be brought in directly from disk in the size and position wanted. Type styles chosen are shown as they will appear on paper, transparencies, or film.



### FACT FILE

#### GRAPH GALLERY

*The Gallery Collection, Version A.01.00*

(*Charting Gallery* and *Drawing Gallery*)

Hewlett-Packard Co.

Personal Software Div.

3410 Central Expy.

Santa Clara, CA 95051

(800) FOR-HPPC

List Price: \$695 (\$395 for *Drawing Gallery*, \$295 for *Charting Gallery*).

Requires: 384K RAM, two floppy disk drives or hard disk; Microsoft Mouse; a printer, a plotter, or a film recorder, DOS 2.0 or later.

**In Short:** Excellent, versatile package of two graphics programs that work together; *Charting Gallery* creates standard business graphs, and *Drawing Gallery* permits extensive customization of graphs, including insertions from its illustrations library. Not copy protected.

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size and features of one object with another, draw lines, connect objects, and fit one object inside another. The program offers fancy borders, decorative corners, and a designer alphabet that gives you the option of beginning a paragraph with a large, elegant letter.

The power and ease of use of *The Gallery Collection* will amaze you. It's not copy protected, and a batch file will help you through a somewhat tedious installation process. A note of warning: the installation program is not compatible with some memory-resident utilities such as *Keywords*, so you should unload *Keywords* before you run *Install*.

*The Gallery Collection* can also run on the HP Office Share and 3Com networks. The display looks gorgeous on an EGA monitor, although one is not required. You can output to dot matrix printers, the HP Laserjet, HP plotters, or compatibles, and the HP 7510A film recorder.

Technical support is \$45 a call or \$45 a month on a contract. Fortunately, the manual and the on-screen menus may be all the help you'll need.

*Marvin Bryan is vice president of research and strategic planning at a leading national advertising agency.*

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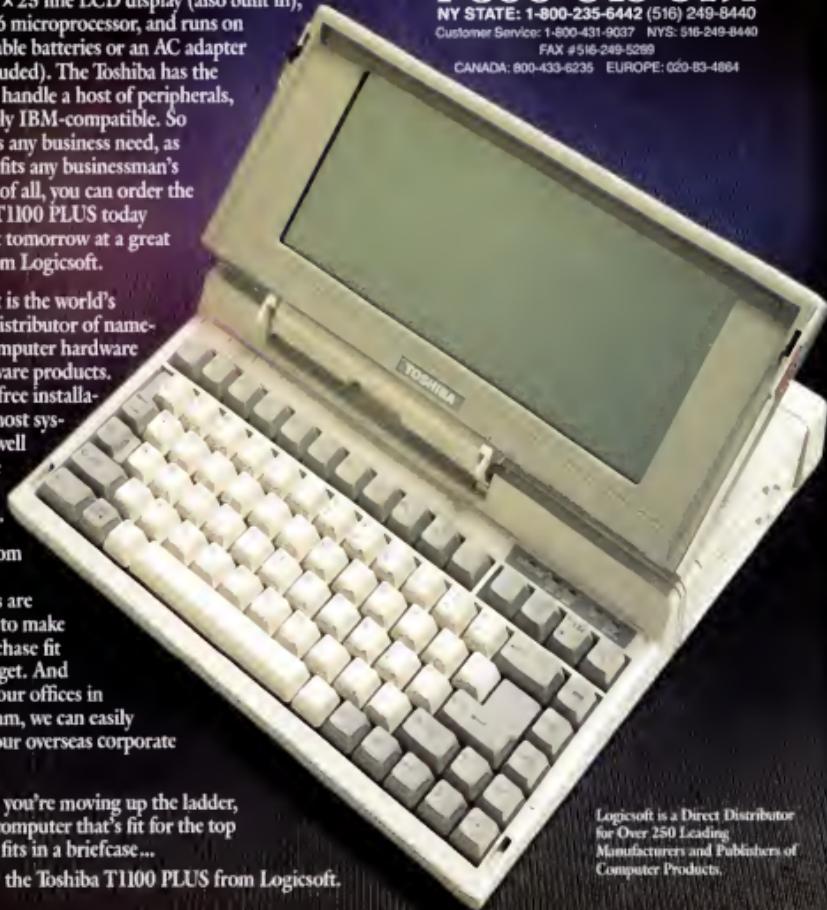
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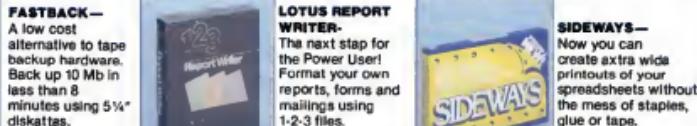
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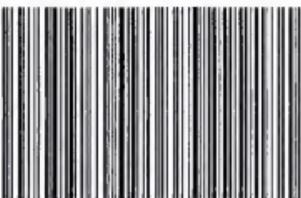
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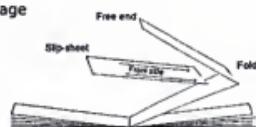
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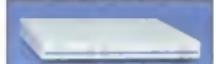
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# *Screen Test* SOFTWARE *for the* IMAGE MAKERS

Hooray for Hollywood! Now you can direct your own moving pictures right on your own private silver screen. To get the show rolling, all you have to do is pick from a variety of presentation software programs that can help get your message across to your intended audience, whether it's a board of directors in a corporate conference room or a group of potential buyers spread across the continent.

Presentation software is nothing new. Back in the dark ages of microcomputing (about 5 years ago), I was looking for graphics support for my computer seminars and figured my trusty Apple II might

help. I found a program called *The Executive Briefing System*, from a then new company named Lotus Development Corp., that let me make text and graphics slides for display on a large monitor. The results jazzed up my presentations and made the sessions more effective.

Today's presentation software for the IBM PC has far surpassed those early programs; resolution is higher, performance is faster, and now you get many more features for your dollar. People have discovered many different uses for presentation software, and while many of the products can be employed for a variety of purposes, individual programs tend to be better suit-

*Presentation software keeps getting better and better. Here are five programs that can help you make a better impression with your marketing demos, tutorials, and prototypes.*

## ■ PRESENTATION TOOLS

ed for some applications than others.

Five different programs are examined here, all of which you can use to present information with your PC. These packages have somewhat different strengths, and taken as a group they define this broad class of software. The aim is not to pick a winner from the five; this is not a comprehensive survey of all the available options. Instead, the goal is to help you become aware of a type of program that you might not know much about—one that could turn out to be a valuable addition to your software library.

There are four major ways to use these programs: as presentations, marketing demos, tutorials, and prototypes.

**SILICON SLIDE SHOW** Computer-supported presentations are perhaps the most obvious application for presentation software. In traditional approaches, you must create your artwork (or request that it be created for you) and then go through a production cycle in which the art is converted into some format that you can project, typically slides or acetate transparencies. Depending on the methods used, revisions can take a day or up to a week to process.

With a PC, however, you can edit your graphics almost as easily as you edit a word processing document. By using the PC itself as the projector, your revisions are complete as soon as you finish editing the slide; no other production involved. You can use a large-screen monitor or projection system so that an entire roomful of people can see the images at one time. The new Sayett Technology System 10 is a compact LCD panel that fits on a standard overhead projector and permits you to project screen images from your RGB output. The net effect is a powerful, up-to-the-minute presentation with the punch of prepared text and graphics slides.

Software publishers of all sizes now rely on demo disks to promote their products. These disks are sold inexpensively or given away to prospective buyers, because more and more users insist on seeing the program before they buy it. Some publishers provide a stripped-down or hobbled version of the real program.

Many publishers prefer to avoid the reprogramming that might be required to do

this, and in some cases the crippled version might not fit conveniently on a single disk. Some presentation programs let developers create simulations of their programs so that prospective users can see how the program works without a major coding project.

**TRAINING DISKS** Presentation software can be used as the basis for disk-based tutorials. Some of these let you simulate the program operation, while others sit "on top" of the real program and control what the user can do with it. These packages also add extra windows to point out the different commands and options as they are presented and to guide you through the tutorial.

Many presentation packages permit branching, which allows you to let the user make decisions about what to do within the tutorial. This also means that you can let the user make mistakes that will be accepted and then trapped by the program. One of my major complaints with many disk-based tutorials is that they only accept the one correct keystroke, never permitting a

Perhaps the most useful and most overlooked use of these products is to demonstrate something that does not even exist yet. Consumers call it "vaporware"; a more polite term is *prototyping*. In either case, it means letting the target user see what the project will look like before it is complete. Whether you are creating a new program for the mass market or just a new account-tracking database for the sales department downstairs, you may find that prototyping is a cost-effective device for avoiding time-consuming design errors.

A colleague recently told me a story about the time when Dan Bricklin, of Software Arts and VisiCalc fame, offered to show him a new integrated program that he was developing. As Bricklin guided my friend through the new program, he showed him that it had a spreadsheet, database, communications, and word processing. To demonstrate the word processor's speed, he had it do a search-and-replace operation. By now his audience was suitably impressed and wanted to know more about the product. Bricklin then confessed that he had written the entire program in just a few hours; it was merely a prototype

he developed to demonstrate his new *Dan Bricklin's Demo Program*.

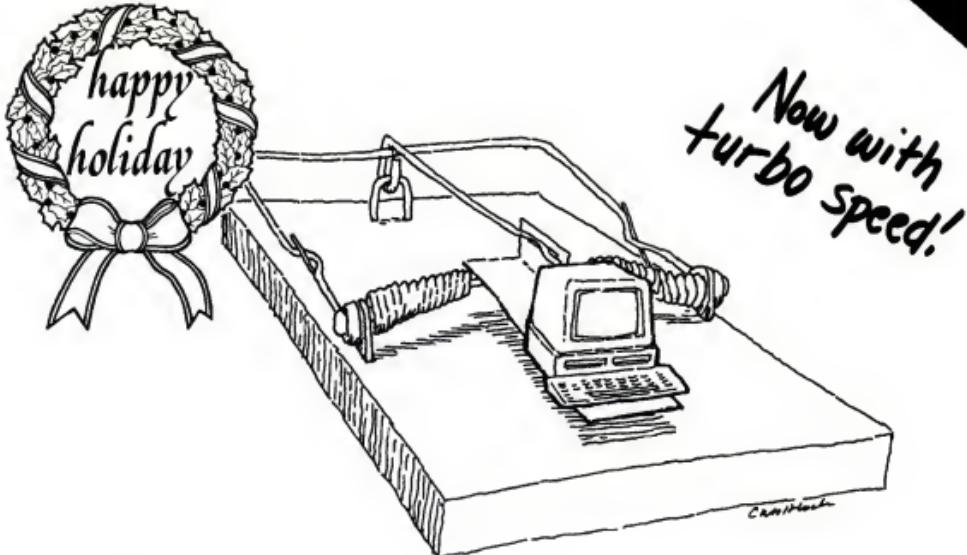
While none of these programs is all that expensive, you wouldn't want to have to purchase a copy for each demo or tutorial you wish to distribute. They all have runtime modules and varying licensing restrictions and fees. *PC Storyboard*, for example, requires only that you credit the program on the disk label. Others permit 50 free copies of the run-time module and require you to make arrangements if you wish to make more copies. If you are going to make hundreds of copies of a run-time disk, you should contact the publisher about its licensing requirements.

By now you may have some idea about how you could put these programs to work. Let's take a look at them and see how their individual strengths and weaknesses affect their usefulness for these different types of applications.

### Dan Bricklin's Demo Program

*Dan Bricklin's Demo Program* is a clever piece of programming that enables you to simulate the operation of software in a controlled environment so that the user will see only what you want him to see. You might choose this prototyping tool to create a program demo disk, to develop a training disk, or to make a prototype of an as-yet undeveloped program or custom application.

PC MAGAZINE		F A C T   F I L E
		<b>Dan Bricklin's Demo Program</b> Software Garden Inc. P.O. Box 373 Newton Highlands, MA 02161 (617) 332-2240 List Price: \$74.95
		Requires 256K RAM, one disk drive, DOS 2.0 or later.
		In Short: Primarily a prototyping tool, <i>Demo</i> has enough features to make it excellent for training and product- demonstration applications. Pop-up menus and well-designed features speed project development. Not copy protected.
		CIRCLE 604 ON READER SERVICE CARD



## What can you expect for \$1000?

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Actually, there's a lot more. Like a built-in clock/calender with battery back-up, support for an optional 8087 math coprocessor, RAM disk software, a print spooler (along with several useful public domain programs) and a hinged, metal XT-style case with six expansion slots.

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## ■ PRESENTATION TOOLS

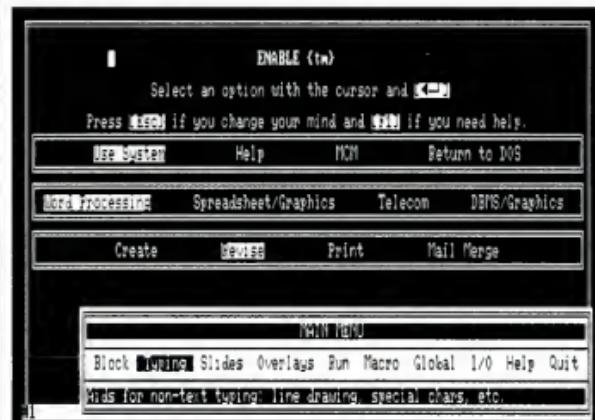
*Demo* uses the slide metaphor for its handling of screens. You develop a set of slides, which are numbered in order, but you have great control over this sequence. A host of well-thought-out function-key commands make short work of duplicating slides or inserting blank slides where you need them, and many more commands are available through pop-up menus. You can move a slide from one position to another, delete a slide, and assign names to the slides to make it easier to refer to them.

Since you need a separate slide each time you change the appearance of the screen, your slide show may require hundreds of slides. *Demo* appears to handle them with speed, and if you do not have enough memory available for all your slides (*Demo* makes it easy to see how much is left), you can easily chain multiple files.

*Demo* provides a range of features to control program flow. For each slide, you can prescribe a series of keystrokes to watch for and then give the results that should occur. These actions can include advancing to the next slide, returning to the previous slide, jumping to a specific slide, sounding a tone, and triggering a complex series of events, such as the playing of a simple melody. You can also call another slide, much like a subroutine, and control will return to the current portion of the demo file when a Return command is encountered.

According to the documentation, you may have up to 99 levels of calls and returns. I did not test this, but I see no reason not to believe it or to think that anyone will ever need to go that far. The same sort of flow-control facilities at the slide level are also available as global settings.

**PHOTO OPPORTUNITIES** *Demo* has lots of other interesting features. A macro facility lets you create and store macros to speed your slide program development. *Demo* even has a learn mode to make this easier. However, you cannot edit a macro once you have created it. There is also a capture program that takes snapshots of your program screens and stores them in RAM. You then enter *Demo*, and it converts the screens into slides. It does this in a single step. Since you can move, duplicate, and delete these slides at will, you



In this sample use of Dan Bricklin's Demo Program, a screen captured from a program is displayed with the Demo menu at the bottom. Note the Lotus-like menu that explains the highlighted option.



Dan Bricklin's Demo Program's help screen shows the many different commands available while running the program. With these various options, you have broad control over editing the screen images.

end up with plenty of control over the images that you bring into your slide show.

This program shows signs that great care and thought have gone into its devel-

opment. I was not able to make it misbehave in the least, whether I ran it on a True Blue IBM XT or a Leading Edge Model D. The menus and prompts are lucid and well



## Meanwhile, our competition is still in the pits.

These days, to win the "advanced technology" race, you have to have great performance and a great price.

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As usual, there's a lot more. Like a SETUP program that configures everything from

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## ■ PRESENTATION TOOLS

organized, and a help screen is just a key-stroke away. Since the slides themselves cover the full 80 by 25 screen, the pop-up menus could pose a problem by obscuring the part of the screen you are editing. Instead, *Demo* appears to know where your cursor is on the slide and brings up the menu in a spot that will be out of the way.

Unfortunately, the documentation is not up to the same painstaking standards of the program. The power of the program is not justly served by the 29-page, stapled user manual that Software Garden provides. This manual is a command reference, showing the tree structure of the commands and their basic use and options, but much more is needed. There are no tutorial exercises to guide you through the application of these commands. In some of the complex operations, such as overlays, a few examples or simple exercises would go a long way toward making it easier to understand how to use these features.

*Demo*'s main shortcoming is that it is a text-only program; you cannot use graphics. You have full control over text display attributes (including color, background, and underlining), you can use line draw and special characters in your slides, but you cannot create any graphics.

Aside from these limitations, this program is a valuable tool. If you need to develop custom applications for end users, want to create realistic training simulations, or have to develop a demo disk, *Dan Bricklin's Demo Program* is worth a good look.

### Show Partner

If you want to dress up your important presentations, you can use *Show Partner* to take your show on the road. The creators of this program have managed to shoehorn a lot of features and functionality into a tight package.

*Show Partner* is in fact two separate programs: the Animator, which controls the show, and the GraFIX Editor, which

**PC** MAGAZINE F A C T F I L E

**SHOW PARTNER**  
"A meeting supervisor"  
© 1986 Brightbill-Roberts and Co., Ltd.

**Show Partner**  
Brightbill-Roberts and Co., Ltd.  
120 E. Washington St., #421  
Syracuse, NY 13202  
(315) 474-3400  
List Price: \$79  
Requires: 320K RAM, one floppy disk drive, graphics adapter and display, DOS 2.0 or later.

**In Short:** *Show Partner* makes it easy to get at custom graphics slide shows at an outstanding price. It will also make it possible for you to create animated sequences if you have the patience and talent. Not copy protected.

<http://www.brightbill.com>

## Flick this switch and go beyond IBM compatibility.



lets you modify the images. The Animator allows you to call up graphics screens in sequence, while you control the transition from one image to the next. You specify what special effects (dissolves, wipes, and so on) to use, plus the timing, location, and speed with which the new image will appear.

You can have up to 400 slides in a single script, which is called an agenda. This may seem like enough for a feature-length film, but if you use the animation features you will find that the slots can fill rather quickly. This is because each change of the on-screen image, such as a moving hand or blinking eye, requires a separate slot in the agenda. These changes can take place very rapidly: ten times per second or even faster. By altering the images this quickly, you create an effective illusion of movement that can add spice to a presentation. Should you run out of space, you can simply chain to another agenda, so that you are limited

## ■ Show Partner's GraFIX Editor is a screen-capture program, a paint program, and a graphics screen editor, all in one.

only by your storage space.

You can assemble the agenda yourself or let *Show Partner* do it for you. It will automatically find the available screen files in your current directory and assign them to rows in your agenda. You can then edit, move, and copy them as required. You can also clip portions of the screen images and place them where you want on the screen. If you need to edit the image in

more detail, you call up the image editor, which can be left residing in memory until you need it.

**EDITING TOOLS** The GraFIX Editor is a screen-capture program, a paint program, and a graphics screen editor, all in one. If you don't have enough memory available, there is a separate program to capture your screens. You can add type in any of 20 different fonts and can change the colors of the image. You can also draw freehand pictures, boxes, and other predefined shapes, fill areas with color, and make borders, all quickly and easily. The Zoom feature lets you edit on the pixel level. An interesting color search-and-replace function and a block color-swap feature make changing the image easy.

The Animator and the GraFIX Editor use similar menus and commands, so both are easy to use. *Show Partner* uses pull-down menus with a variety of commands

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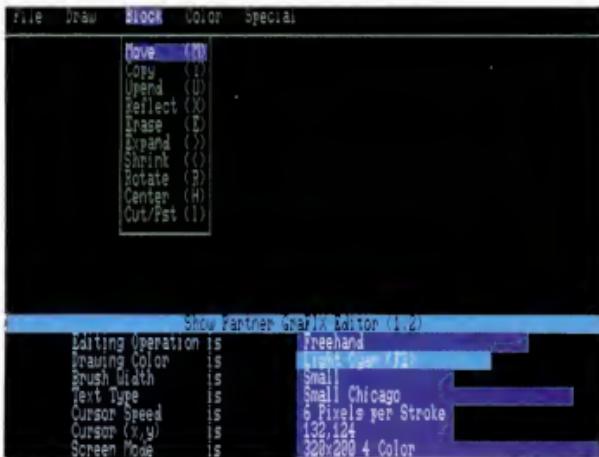
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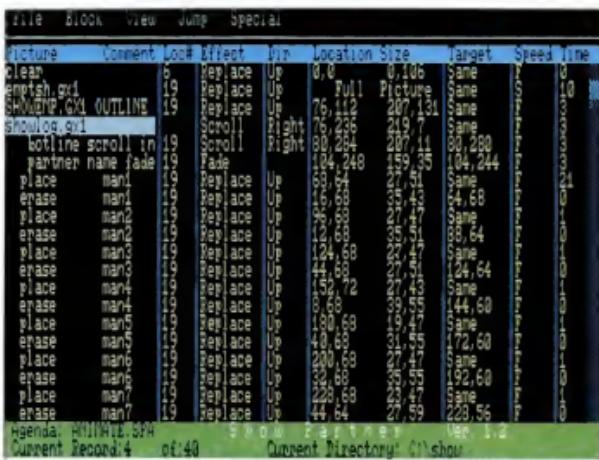
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## ■ PRESENTATION TOOLS



The pull-down menus in Show Partner's GraFX Editor are easy to read and understand, as shown in this illustration of the various block commands. Note at the bottom of the screen that the current settings are listed for easy reference; these can be changed with the pull-down options.



Here is an example of part of an animation sequence in Show Partner. Note the many steps required to display and remove the segment of the image that is used to create the animation. While it is fairly easy to create these many lines, it is still a time-consuming process.

in each. The NumLock and ScrollLock keys are used to trigger commands, which is unusual, but I found that I got used to it fairly quickly. Both programs also make good use of a mouse; I highly recommend that you use it if you have one. The left and right buttons correspond to the NumLock and ScrollLock keys, so it is relatively easy to switch back and forth between the mouse and the keyboard.

The documentation is clear and well written, with plenty of examples in the large tutorial sections. There are two versions of the tutorials: one for the keyboard and one for the mouse. The manual indexes are a little skimpy, but the manual's organization makes it relatively easy to find what you want in spite of this. There are also dozens of sample files and clip art images included, so that you can see complex examples of *Show Partner*'s power.

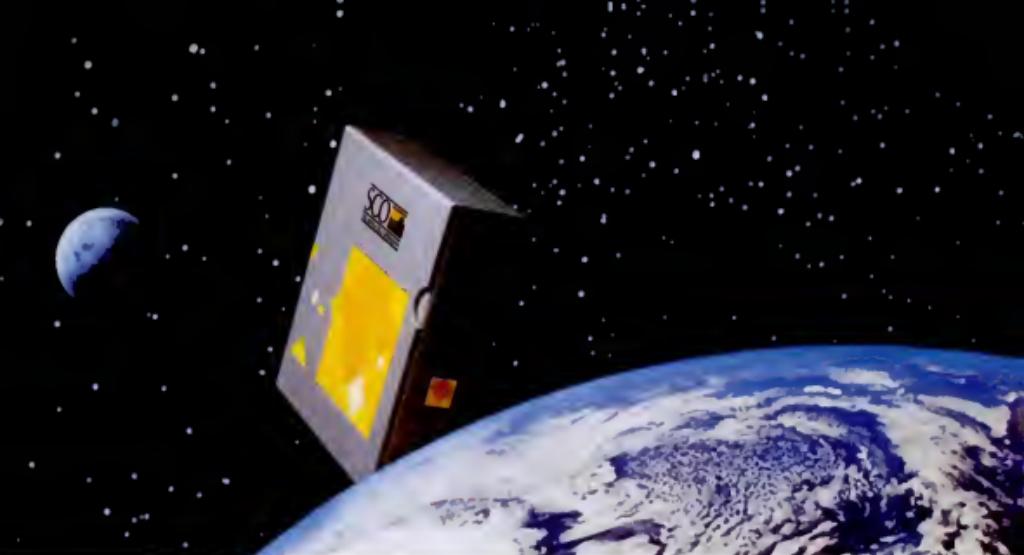
The only major problem I encountered was in loading the editor. When I called to ask why it was crashing, the person on the other end quickly explained the cause of the problem (DOS 2.x), how to resolve it, and offered to take my name so that I could get an update.

With *Show Partner*, you will be able to make dazzling demos and presentations. It is oriented toward graphics images and is less useful for prototyping applications and tasks that require a lot of branching. The animation features are attractive and powerful, but keep in mind that you will need to invest lots of time getting the images sequenced and placed the way that you want before you get results like those in the demos. Even without getting involved in the animation, you may find this to be a useful display tool.

## PC Storyboard

If you walked into an IBM Product Center store (back when there were IBM Product Center stores) and saw a colorful demo program extolling the virtues of IBM printers or computers, chances are that the fancy custom program was simply a *PC Storyboard* "story." This program lets you quickly create slide shows that use a variety of effects.

*Storyboard* is made up of four modules. Picture Maker is the screen editor, Picture Taker is a screen-capture program, Story



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## ■ PRESENTATION TOOLS



### FACT FILE



**PC Storyboard**  
IBM Corp.  
P.O. Box 2328  
Minalo Park, CA 94025  
(800) 426-2468  
List Price: \$275  
Requires: 320K RAM  
(only 256K required with  
DOS 2.0 or 2.1), one disk drive, graphics  
adapter and display, DOS 2.0 or later.

**In Short:** Four programs in one package, *PC Storyboard* captures graphics images, edits and creates graphics screens, organizes them into slide shows with a variety of special effects, and lets you create run-time disks that you can give away with your slide show on them. It is especially suited for text and graphics screens. Not copy protected.

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**Editor** assembles the script, and **Story Teller** is the run-time version. None of the modules is overendowed with features, but each does a straightforward job of getting your message to the screen.

**Picture Maker** has the most commands to learn. It provides almost all of the features that you might expect to find in a paint program, except that there is no mouse support. This is a serious drawback if you are planning to do extensive freehand artwork, but since many people will only need some boxes and circles this is probably not as big a deficiency as it might seem. IBM does provide a range of handy graphics as clip art, including banners, arrows, people, and hands, all of which can be copied onto your own slides to add some zip.

**Storyboard** has two features that deserve special mention. The first is its facility to create vertical and horizontal bar graphs, pie charts (with multiple exploded pieces), and line graphs. You must key in the data elements when you create the slide, but for simple graphs this can be handy. You also have the option of capturing graphs, which are displayed by other programs, using the Picture Taker module.

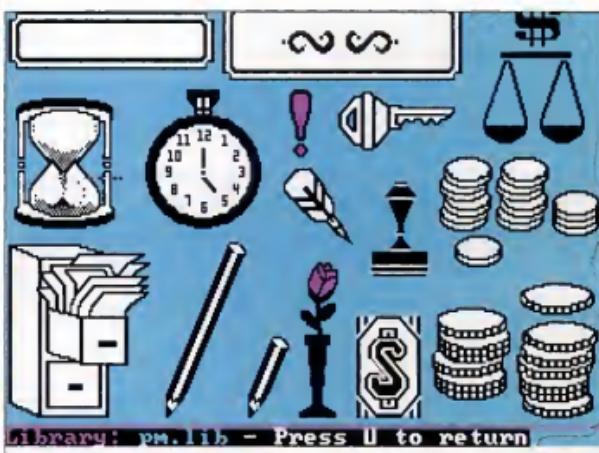
**DEPTH AND DRAMA** The other nifty feature is the automatic shading for text and graphics elements. By adding a band of color (typically a darker color) around

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This screen shows the dramatic effect you can get with the automatic shading of PC Storyboard. Note how the shading creates the illusion of depth. You can determine the direction and amount of the shading.



PC Storyboard includes 12 separate screens of clip art that you can incorporate in your slides. In addition to the ones shown here, you can use banners, people, hands, arrows, computers, and more.

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Border Options	Borderless - IP Standard, Edge-to-Edge, Graphics, Print Area Only, LPT1

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## ■ PRESENTATION TOOLS



Here, a piece of PC Storyboard clip art has been taken from the previous screen and pasted onto the first screen, which was shaded. The image can be moved around the screen until you get it precisely where you want it.

your letters, graphs, or boxes in your slides, you add the illusion of depth. This adds some drama to otherwise flat images and helps make information stand out. You can paint these shadows by hand, but this can be tricky. *Storyboard* will automatically provide the shading for you, and you get to specify the direction of the drop shadow and its degree.

One problem with the Picture Maker is that the commands are all triggered by letter keys. While they are somewhat mnemonic, the choices are not always intuitive. Fortunately, IBM provides a cue card, which sits along the top edge of the keyboard, that lists the various commands grouped by function.

The Story Editor function provides a variety of methods for switching screens, running the gamut from a simple replace where the new picture overlays the old, to a fade where the old image is replaced by randomly adding pixels from the new image until the old one is covered. You control the direction of the replacement and the time it takes to complete. *Storyboard* also lets you replace just a portion of the

image, which makes it easier to focus on certain portions of a screen.

Story Editor also has a range of program flow-control commands, including Goto, Gosub, and If statements. You can

also use commands to switch colors on the display, accept input from the keyboard, and chain to another script.

The *Storyboard* manual is more than 150 pages long, filled with command tables and screen shots of sample images. It has a strong tutorial that introduces you to most of the program's features. As a result, you should be able to start creating your first slide show within a short time after loading the program.

*Storyboard*'s graphics and fonts are a little coarse, but they are well suited for live presentations and sales demos. The results are highly visible, and with the shadowing technique your visuals can have a strong impact. You can expect to get consistent results without too much effort using *PC Storyboard*.

### Instant Replay

Nostradamus was the name of a medieval physician who made wondrous yet cryptic prophecies of the future. Like their namesake, the creators of *Instant Replay* have produced a work that has marvelous powers, but these are somewhat obscured.

*Instant Replay* is a program that simply lets you record your keystrokes and plays them back. This may not seem like much until you consider just what you can do with this. You can run any program and play the entire process back later,



The Instant Replay pop-up menu offers different options for memorizing keystrokes and other features that you can use while in the middle of creating a keystroke program.

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## ■ PRESENTATION TOOLS



### Presentation Tools: Summary of Features

This table illustrates the differences and similarities among the five presentation programs reviewed. These programs do not belong to one specific class of software. Each, however, has strengths that make it more suitable for one of the four major applications of this software: presentations, marketing demos, tutorials, and prototyping. *Show Partner* and *PC Storyboard* are the only programs that allow the use of special effects such as fades, dissolves, wipes, and explosions to be used as one screen changes to another. All the programs can capture screens for storage on disk, but they vary in the size of the screen that they can store. All five programs can control the sequence of the slides with single or multiple branching, but *Instant Replay* cannot do loops or chain a slide to another script, and neither *Instant Replay* nor *Show Partner* can do subroutines. Only *Dan Bricklin's Demo Program* allows you to create your own high, middle, or low tones, and it can even create a tune to be played between slides. *Dan Bricklin's Demo Program*, *Show Partner*, and *Instant Replay* are the only programs that can incorporate slides with programs in high-level languages such as Pascal or C. However, in *Instant Replay*, this feature is an add-on that costs extra.

	<b>Dan Bricklin's Demo Program</b>	<b>Show Partner</b>	<b>Instant Replay</b>	<b>PC Storyboard</b>	<b>Auto- Mentor</b>
<b>Price</b>	\$74.95	\$79.00	\$89.95	\$275.00	\$495.00
<b>Graphics</b>					
Line graphics	●	○	●	●	●
Free-hand graphics	○	●	○	○	○
Clip-art files	○	●	○	●	○
Simple geometric shapes	○	●	○	●	○
Number of custom fonts	None	20	None	4	None
Special effects	○	●	○	●	○
<b>Screen Advance</b>					
Time delay	●	●	●	●	●
On any keystroke	●	●	●	●	●
On specific keystroke	●	●	●	●	●
Combinations of above			○	●	●
<b>Screen-Capture Routine</b>					
	●	●	●	●	●
<b>Hardware Support/Options</b>					
Hercules support	●	●	○	○	●
EGA support	●	●	○	○	●
Mouse support	○	●	○	○	○
Remote slide controller	○	○	○	●	○
<b>Program Control</b>					
Single branch	●	●	●	●	●
Multiple branch	●	●	●	●	●
Loops	●	●	○	●	●
Subroutine (call & return)		○	○	●	●
Chain to other scripts	●	●	○	●	●
<b>Customized Sound</b>					
Single tone	●	○	○	○	○
Multiple tones (music)	●	○	○	○	○
<b>Other Features</b>					
Runs "on top" of other program	○	○	●	○	●
Learn mode for keystrokes	●	●	●	○	●
High-level language interface	●	●	●	Optional	○
Run-time version	●	●	●	●	●
Copy protected	○	○	○	○	○

● Yes ○ No \*For only one demo

plete with pauses, so that someone else can see the precise steps that you took.

Should you make mistakes, the Keystroke Editor module lets you view each keystroke and change both the stroke itself and the length of time before the next one. The editor also has a host of commands that permit you to insert or delete strokes, jump to the beginning or end of the sequence, and even search for a specific keystroke.

While memorizing keystrokes within an application, you can trigger a pop-up window of commands. These will let you pause or end the recording, or create a pop-up prompt of your own to appear on the screen when the sequence is played back. The prompt can appear automatically or

### PC MAGAZINE

#### F A C T F I L E



**Instant Replay**  
Nostradamus Inc.  
5320 S. 900 East, #110  
Salt Lake City, UT  
84117  
(801) 261-0769  
List Price: \$89.95  
Requires: 128K RAM,

one disk drive.

In Short: *Instant Replay* is a powerful program that is a bit more difficult to master than some of the others. Its primary strength is its ability to control the execution of other programs. Not copy protected.

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can be triggered by an action by the user.

If you prefer not to run *Instant Replay* with an existing program but would rather simulate one instead, you have a number of tools available to you. A screen-capture feature lets you grab the image of a program in action. You can also use the full-screen editor, called Screen Genie, to create new screens or modify captured ones. Since *Instant Replay* is a text-oriented program, you are limited to character line drawing on your screens.

**ON-SCREEN ACTION** The Prototype Maker, another tool supplied with *Instant Replay*, allows you to sequence screen images. You can create pop-up windows, overlayed images, or simply replace one

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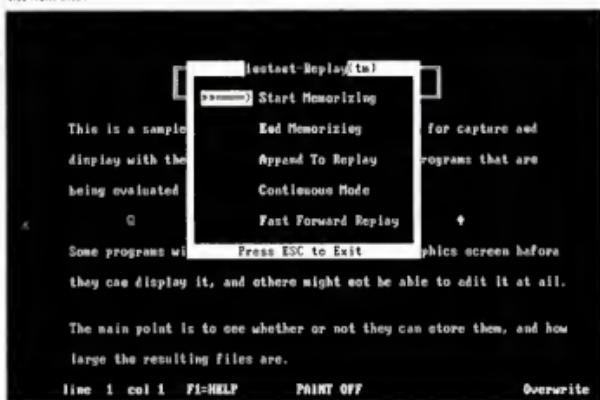
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## ■ PRESENTATION TOOLS



New Pause Value May Be Entered. Overwrite

Instant Replay's Keystroke Editor allows you to modify sequences of keystrokes. This is a powerful utility that enables you to clean up any mistakes that you may have made while creating a program. With the Keystroke Editor, you can change both the keystroke itself and the length of time before the next one.



The Instant Replay pop-up menu offers different options for memorizing keystrokes and other features that you can use while in the middle of creating a keystroke program.

image with another. You can also create simple menus that will call up different screens; however, this is a much less powerful option than the branching offered by some of the other programs covered here.

Instant Replay also includes Word Gene, a full-text editor complete with Word-

Star-like commands, block functions, and macros. The manual suggests that you can use this to create a text file and then use Instant Replay to record a session of browsing the text to present the information to the user. There is no run-time version of the editor; you are allowed to distribute the

whole program under the distribution licensing available with the product.

Instant Replay's greatest liabilities are its disjointed structure and ragged documentation. While you can access the different modules from a central menu, they all behave differently. Nostradamus does not provide demo files with the product, and the tutorials have you use the utilities themselves in the exercises.

The documentation does not help much either. Each section stands alone, with little explanation of how the modules work together. There are few examples, and the only screen illustrations are clumped together without comment at the end of each section. The plastic comb binding does not include any tabs to separate sections, and it can be difficult to look up specific information quickly.

Instant Replay appears to be a techie's tool: it's a lot of fun to get inside and explore, and it has a lot of power to exploit once you figure out how. Nostradamus also offers a range of programming tools, including code generators that will convert your Instant Replay screens into C and Pascal code. You can make some interesting things happen with this program, but be prepared to work at it.

## AutoMentor

AutoMentor fits right in with the idea of a screen test. Instead of using the old-fashioned slide metaphor, which doesn't adequately account for animation, it puts everything in terms of a tape recording: you can visualize the entire process as successive entries on a videotape.

The program is memory resident, and you can call up the menu at any time with a Ctrl-Ins keystroke. The control panel has record and playback buttons, and you can access a tree-structured set of commands. These let you edit existing sections of the tape, scroll the tape back and forth, or change tapes entirely.

If you are recording, you can record the keystrokes as you issue them in an actual application. This means that you can create a demonstration that actually runs the program that you wish to demonstrate. While this may seem a bit strange, the tutorial exercises in the manual include a good example of this feature using DOS com-

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This is a sample screen from an AutoMentor demonstration, with the AutoMentor menu called over it. Note that, in the menu, the word "UNLOAD" is highlighted; this is the current location of the "tape head," which marks the step currently being executed.



The Animator help screen proves that AutoMentor makes excellent use of the function keys and provides a wide range of cursor control movements. The Draw command ([F3]) makes it simple to create lines and boxes with user-specified characters.

mands. You create an *AutoMentor* tape that issues the DOS commands, with the advantage that you also create windows that appear on the screen with prompts, notes, and questions for the user to see.

Not everyone wants to use the full application as part of a demo, and *AutoMentor* works well if you merely want to simulate a program. There is a companion module, called the Animator, that does little except provide you with an environment in which to create screens that are manipulated by an *AutoMentor* tape.

**SPECIAL EFFECTS** Within Animator, you can control print attributes, movement of text on the screen, and other special effects. You can make a section of text appear on the screen and then highlight or invert certain words for emphasis. The movement and visual effects add power to an *AutoMentor* tape. You can also capture screens directly from your application and then import them with *AutoMentor* for editing and animation.

*AutoMentor* has a set of commands that you can insert in a tape to control the flow. You can specify a branch to a different tape, and you can resume the first tape when the second is finished with the return option. You can also link tapes together.

The manual is uneven and a little difficult to use. After a strong tutorial section, the reference section is harder to manage. The organization is choppy, but there are



## FACT FILE

### AutoMentor

#### AutoMentor, Version

2.1  
Software Recording  
Corp. of America  
6060 N. Central  
Erlanger, TX 75206  
(214) 368-1196

List Price: Starts at \$495, depending on level of support.

Requires: 256K RAM, one disk drive.

In Short: *AutoMentor*, a straightforward program, develops demos and tutorials that can either stand alone or be used in conjunction with existing programs. Its visual user interface might make it easier to learn for less-technical users. Not copy protected.

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Shareware LaserWare V7.0



Monthly Dow Jones Industrial Average

Month	Most	High	Low	Last	Change
Sept 1986	1870.36	1919.73	1755.30	1867.58	+130.26

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proportional font

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graphics from any  
program

Create forms with  
lines, boxes and  
shading

## LaserWare Unlocks LaserJet Potential for \$99.95



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**Font Control** LaserWare's extensive capabilities include commands for text justification, centered headings, decimal aligned columns, and font changes. All commands operate with any combination of fonts, meaning that proportional cartridge fonts and soft fonts can be mixed and formatted with the same simple commands. LaserWare also includes macros to make complex jobs as simple as issuing one command. In addition, the selection of cartridge or soft fonts is handled by a pop-up menu that makes choosing and downloading fonts as easy as point and shoot.

**Graphics Integration** LaserWare also allows text and graphics to be merged on one page. Graphic plots can be saved from any graphics package supporting either the LaserJet or Epson FX formats. Graphics can also be saved from the screen. Stored graphics can then be included in a text document in any LaserJet resolution with one easy command. In addition, LaserWare will automatically drop all of the white space from a plot. This operation permits up to 75% larger plots by conserving on the limited graphics memory in the

#### ■ Compatible With:

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**Compatibility** LaserWare is compatible with all of the software titles listed, and many others. LaserWare also works with other resident programs like SideKick, Prokey, Superkey, Keyworks and

Spotlight to name a few. LaserWare has been extensively tested for compatibility, and has proven time and again to function smoothly with word processors, spreadsheets, databases, integrated packages, resident utilities, graphics programs and more! In addition, our support staff is always there to help you through any questions that may arise in the installation or use of LaserWare.

LaserWare can get more from a LaserJet printer than any other software. More font control. More graphics. More forms. And, priced at \$99.95, LaserWare is within the reach of every LaserJet owner's budget. Best of all there's a 30-day money-back guarantee, so we invite you to put LaserWare to the test on your LaserJet without risk.

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## Product Facts

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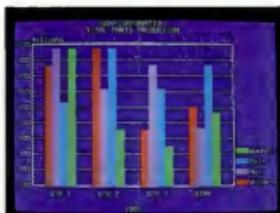
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## ■ PRESENTATION TOOLS

plenty of examples and a fairly thorough index to help you along. The major problem is that a lot of good information is buried in the appendices where you cannot easily find it. The manual also has three excellent pages of tips on how to design an effective tape.

**AutoMentor** includes a handy utility program, called Map. Since **AutoMentor** loads and stays resident in memory, there are ample opportunities for conflicts with other programs. Map will display a chart of memory resident programs, including DOS, so you can see what you have loaded already. If you are running DOS 3.x, Map will even show you the program's name.

**AutoMentor**'s greatest strength is its strong visual metaphor of the tape; this makes it easier for the user to grasp some rather slippery concepts. It does not have as many features and options as some of the other programs mentioned here, but it is a solid program that should offer plenty for most needs. [At press time, **Software Recording Co. of America** started shipping Version 2.2 of **AutoMentor**, which includes a tape search-and-motion command, a Tab and Shift-Tab feature, a black-and-white filter, a fast-block paint, and window expansion by tabs.—Ed.]

**FINAL IMPRESSIONS** These five presentation programs represent a variety of features in different combinations. For straight presentations and attraction demos, **PC Storyboard** seems to have an edge. For text-oriented prototyping, program demos, and some tutorial applications, **Dan Bricklin's Demo Program** is a standout value. **Show Partner's** clip art and animation features make it one of the more-powerful graphics programs in the group. **AutoMentor**'s user interface makes it easy to develop scripts quickly, and **Instant Replay** lets you run scripts on top of the actual application.

With a little patience and practice, you could soon produce dynamite demos or be a boardroom hero at your next sales meeting. Presentation software may go into your PC as a bunch of disks, but what comes out may make you a star! ■

*Alfred Poor is a consultant with Soft Industries in Southington, Connecticut, and is a frequent contributor to PC Magazine.*

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# Don't Let "English-Like" Database Programs Put You On Their Menu.

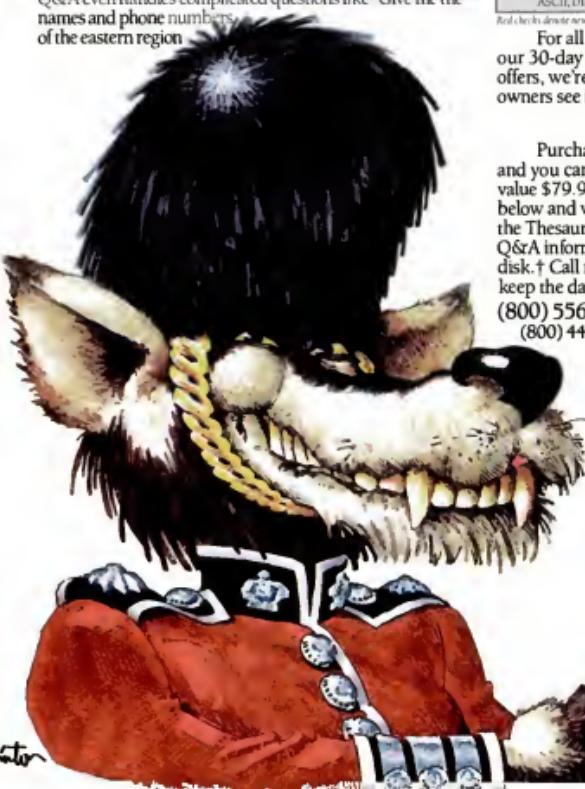
Once upon a time, databases like dBASE, PFS and Paradox were advertised as "easy-to-use." With "English commands," or an "English-like" query language. Unfortunately, some of you believed. And were bitten.

Well, the fairy tale's over. Here's the reality. What they call English is not really English at all. Oh, there's a smattering of English words here and there all right . . . on menus or screen labels. But when you want to get information out of their database, a computer language takes over. And if you can't speak it, you're in a lot of trouble.

Now unless we're mistaken, the reason you buy a database is not to learn a second language. It's to get information in and out. That's why the official language of Q&A™ is genuine English. Not English-like commands, real honest to anglo saxon. To get answers from a Q&A database, simply type a question into your computer just the way you talk. If you want to know which salespeople sold more than average in the last six months, you actually type in:

WHICH SALESPERSON SOLD MORE THAN AVERAGE IN THE LAST 6 MONTHS?

Q&A even handles complicated questions like "Give me the names and phone numbers of the eastern region



salespeople who work for Craig Elliott and whose sales are below average. Sort them by state, and show me their commissions and commission to salary ratios."

Q&A includes a powerful database manager, a flexible database reporter, and a fast, full-featured word processor. You can use it for record keeping. Word processing. Custom mailings. Inventory tracking, letters, reports and much more. With Q&A, merging a mailing list with a form letter just doesn't get any easier.

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CONNECTIVITY:  
Second in a Continuing Series

# MAKING CONNECTIONS AT&T'S STARLAN

# A

T&T's StarLAN is meant to be more than a LAN. It's a part of AT&T's Information Systems Network (ISN), a larger architecture for information transfer, similar to IBM's Systems Network Architecture (SNA). This architecture can link personal computers, mainframes, and AT&T 3B2 and 3B20 minicomputers and provides a bridge to Ethernet Networks.

An AT&T 3B2 running under UNIX can also act as a server for StarLAN; software allowing the 3B2 to run under MS-DOS should be available by the first quarter of 1987. The AT&T UNIX PC can also operate as a server for StarLAN workstations, running under either UNIX or MS-DOS, and it can translate files between the two operating systems. AT&T also offers several gateway products

New standards have made it easier than ever to put together a LAN of software and hardware from different vendors. For LAN do-it-yourselfers, we've evaluated AT&T's StarLAN interface cards with two different servers running StarLAN networking software. We also report on StarLAN cards working with Novell's *NetWare*.

to link local area networks to mainframes.

**A MULTIFACETED NETWORK** Networks consist of many parts, including interface cards, cables, servers, wiring hubs, and software. New standards in networking software and alternative sources of hardware make it possible to put together your own LAN, using parts from many suppliers.

StarLAN is a good example of this. Many vendors make StarLAN-compatible networking cards and chips, and offer auxiliary products for the network. Novell sells the StarLAN boards bundled with *Advanced NetWare*. Therefore, to make this review of StarLAN more useful, *PC Magazine* evaluates StarLAN interface cards with various servers and networking software.

FRANK J. DERFLER, JR.

## ■ AT&T'S STARLAN

In the previous issue of *PC Magazine* ("Making Connections: LANs Under NetWare," Volume 5 Number 21), we reviewed StarLAN networking cards running under Novell's *Advanced NetWare/286* networking software on an 8-MHz IBM PC AT server. In this review, we evaluate *StarLAN* running under AT&T's *StarLAN Network Program* software on an AT&T 6300 Plus (AT-compatible) server and also on a PC AT. The benchmark tests chart and features table summarize our results from both issues.

**STARLAN HARDWARE** The StarLAN network adapter cards are full-length circuit boards that have modular wiring jacks similar to those used in modern telephone systems. The cards come out of the box ready to install into any long slot on your PC. The jacks make installing the media simple as well; you just click the twisted-pair cables into place. There's no need to fuss with T-connectors or terminating resistors as with coaxial cable-based systems.

You can configure StarLAN as either a bus, with wiring connecting each station to the next, or as a star, with a single cable running from each workstation to a central wiring hub, called the Network Extension Unit. The bus configuration saves wire and may simplify installation, but you must dismantle large portions of the network to diagnose a problem. The bus also limits you to an 800-foot-long network.

Using the star configuration will cost you an extra \$575 for a wiring hub, but this setup makes troubleshooting easier. You simply unplug each station from the hub in turn. When you disconnect the offending station, the network is immediately restored; two status lights on the Network Extension Unit blink to alert you to the network restoration. You can connect up to ten workstations to one extension unit and then connect extension units to add stations or extend the distance between stations.

StarLAN's twisted-pair wiring is expensive, but it includes excess capacity that can carry voice calls to private branch exchange (PBX) or key-system telephone switches. In addition, if your office has the proper multiconductor telephone cabling, you can use those cables to carry data sig-



### Benchmark Tests: StarLAN

The critical factor for these benchmark tests is the speed degradation that the network demonstrated under load. StarLAN interface cards running StarLAN Network Program on the AT&T 6300 Plus showed the slowest results of all the networks tested thus far in our series. StarLAN cards with an AT server tested slower running StarLAN software than the same cards and server running under Novell's NetWare. The token-based ARChet system from Standard Microsystems Corp. and the directly connected NetWare/S-Net system from Novell did not start out fast, but they degraded only in small, predictable steps under load.

#### Network Speed Under Contention Test

Interface cards	Software	Server	Performance Times				
			Zero stations	One station	Two stations	Three stations	Four stations
StarLAN cards	StarLAN Network Program	AT&T 6300 Plus	121.95	150.55	182.60	200.22	270.26
StarLAN cards	StarLAN Network Program	8-MHz IBM PC AT	105.49	118.58	149.61	160.00	188.51
StarLAN cards	Advanced NetWare/286	8-MHz IBM PC AT	58.41	70.12	75.68	81.86	93.46

Interface cards	Software	Server	Performance Times				
			Zero stations	One station	Two stations	Three stations	Four stations
NetWare/S-Net cards	Advanced NetWare/286	Novell Server 68B	71.00	83.70	94.29	103.71	115.68

Interface cards	Software	Server	Performance Times				
			Zero stations	One station	Two stations	Three stations	Four stations
ARCnet cards	Advanced NetWare/286	8-MHz IBM PC AT	59.45	62.14	67.83	78.21	92.56

#### Network plus Server Cruncher Test

Interface cards	Software	Server	Performance Times				
			Zero stations	One station	Two stations	Three stations	Four stations
StarLAN cards	StarLAN Network Program	AT&T 6300 Plus	121.95	186.66	245.32	313.58	470.35
StarLAN cards	StarLAN Network Program	8-MHz IBM PC AT	105.49	154.56	198.80	253.48	305.33
StarLAN cards	Advanced NetWare/286	8-MHz IBM PC AT	58.41	80.47	112.00	131.26	156.65

Interface cards	Software	Server	Performance Times				
			Zero stations	One station	Two stations	Three stations	Four stations
NetWare/S-Net cards	Advanced NetWare/286	Novell Server 68B	71.00	73.05	79.45	86.87	91.00

Interface cards	Software	Server	Performance Times				
			Zero stations	One station	Two stations	Three stations	Four stations
ARCnet cards	Advanced NetWare/286	8-MHz IBM PC AT	59.45	65.85	73.87	110.65	128.63

Interface cards	Software	Server	Performance Times				
			Zero stations	One station	Two stations	Three stations	Four stations
StarLAN cards	StarLAN Network Program	AT&T 6300 Plus	107.30	117.00	140.00	153.00	186.00

Interface cards	Software	Server	Performance Times				
			Zero stations	One station	Two stations	Three stations	Four stations
StarLAN cards	StarLAN Network Program	8-MHz IBM PC AT	79.00	83.00	88.00	95.50	107.50

Interface cards	Software	Server	Performance Times				
			Zero stations	One station	Two stations	Three stations	Four stations
NetWare/S-Net cards	Advanced NetWare/286	Novell Server 68B	81.00	81.00	62.00	63.00	84.00

Interface cards	Software	Server	Performance Times				
			Zero stations	One station	Two stations	Three stations	Four stations
ARCnet cards	Advanced NetWare/286	8-MHz IBM PC AT	47.00	49.50	49.50	50.50	50.50

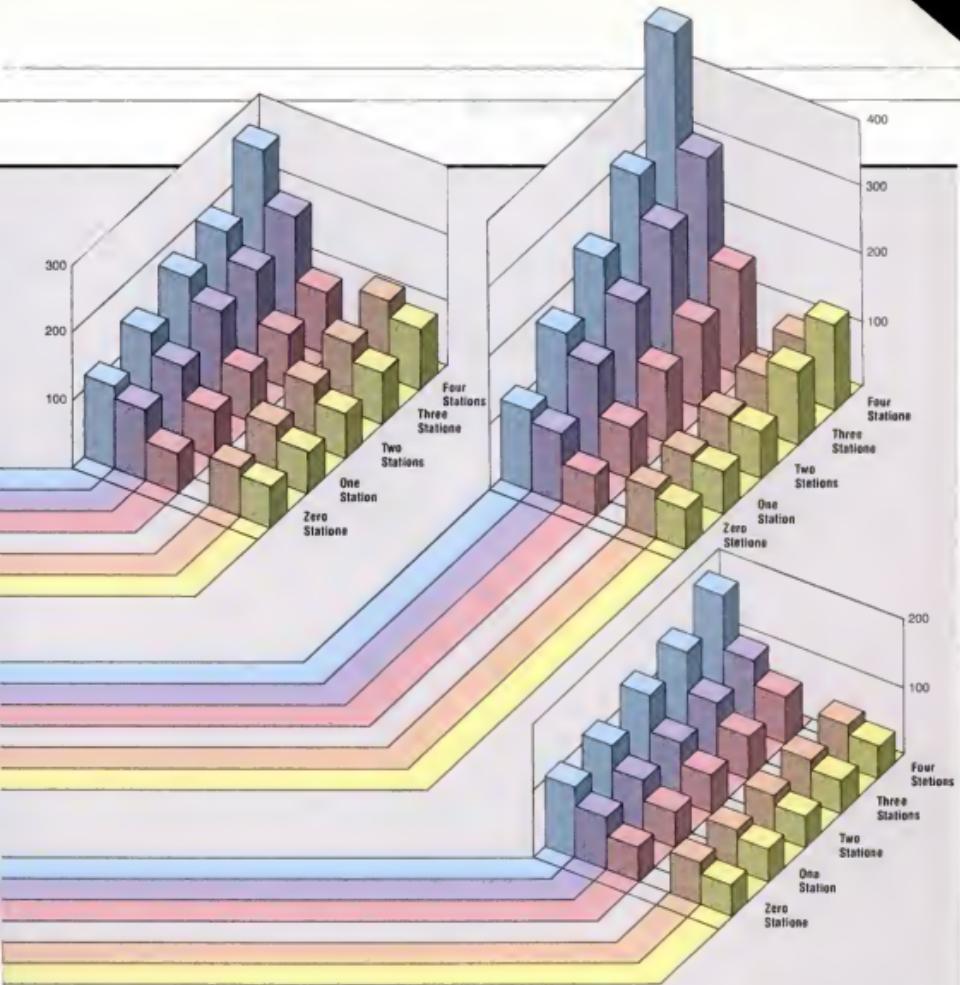
In this issue PC Labs tested the AT&T StarLAN interface cards running in various configurations. Each configuration is clearly identified on the table showing the actual results of our tests. Using its proprietary software, the StarLAN card was tested on two different servers: Novell's NetWare/S-Net and ARCnet's ARChet.

For easy comparison, we also include several of our test results that appeared in *PC Magazine*, Volume 5 Number 21, such as those for the StarLAN cards tested on a PC AT server running under Novell's Advanced NetWare/286. In addition, we include results for Standard Microsystems Corp.'s ARChet, which received Editor's Choice in this issue, and for high performer Novell's NetWare/S-Net.

Each configuration allows the servers to operate only in the dedicated mode and not as dual-purpose server/workstation. The benchmark tests were run using a network

of three IBM PCs, one IBM PC AT, and one IBM PC-XT as workstations. All networking software was installed using the default configurations. No attempt was made to "fine-tune" the buffers or other parameters to achieve better performance in any one test.

For both the Network Speed Under Contention and Network plus Server Cruncher benchmark tests, the dependent variable is the time it took for the IBM PC-XT on a LAN to perform a standard set of DOS read/write commands against a single data file residing in the server. The independent variable was the network load. We began with the heaviest load, four network workstations running DOS batch files, asking for constant streams of data files from the server. Then we decreased the number of stations one by one to reduce the network load.



The three-dimensional chart on the right shows the time it took the XT to perform the test under the varying network load on each network. For comparison, we give the time it took to run the same test on the XT's internal hard disk (Zero stations).

The chart on the left shows the Network Speed Under Contention test and the Network plus Server Cruncher test in the size of the data blocks that the workstations moved over the network.

The Network Speed Under Confinement test exercises the network when the network interface cards and the media are heavily loaded. We attempted to eliminate the factor of server disk access time from this test by loading the network with data blocks small enough to reside in the server's cache memory on most systems. In addition, we varied the size of the data files to detect any cache limits.

The Network plus Server Cruncher test heavily loads the network interface cards, the media, and the server's disk drive access system. In this case we used data blocks of various sizes: some small, some large. When we loaded the network in order to exercise the hard disk access system, the transfers are influenced by hard disk parameters and the efficiency of the networking software as it moves data on the disk and between the disk and the network interface cards.

During both of these tests, we used a hardware clock residing on an AST Six Pack card in the XT to determine the starting and ending times. We did not use the system clock because its operation can be disturbed by some network functions.

The Smart Test of integrated networked programs from Innovative Software gave us a practical way to evaluate networks under the load of typical applications.

In fact, viewed on a system monitoring screen such as NetWare's **Smart Applications** benchmark test looks and acts like a busy office, because the level of activity varies between intense use of the network and quiet periods when processing takes place.

For the departmental wireless network on the three-dimensional chart, we ran an IBM PC XT operating Innovative Software's Smart DBMS running a script file that indexed and sorted shared database records. The independent variable was one through four workstations running another script from Innovative Software that created bursts of activity interspersed with periods of silence.

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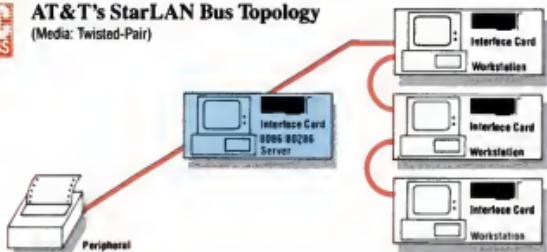
For more information, call us today at 1-800-241-IRMA, ext. 518.

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## ■ AT&T'S STARLAN



### AT&T's StarLAN Bus Topology (Media: Twisted-Pair)

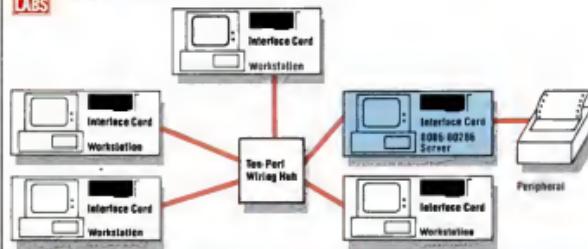


The StarLAN system consists of (1) a full-length network adapter card for each server and workstation on the network and (2) an optional ten-port wiring hub. We used an 8-MHz IBM PC AT and (3) an AT&T 6300 Plus (shown here) as servers in our tests running (4) AT&T's StarLAN networking software. Workstations can be up to 800 feet from a hub. You need a second hub to extend the network beyond that distance or to connect more than ten workstations to the network. Workstations can be up to 10 feet apart. The connecting cable (5) is twisted-pair wiring using modular telephone plugs and jacks.

Electrically, StarLAN is a CSMA/byte-type system, in which the stations share the wiring by listening before they transmit. Physically, you can connect the workstations together in either a bus, hooked up to the other on either side, or a star, in which all stations are connected to a central hub.



### AT&T's StarLAN Star Topology (Media: Twisted-Pair)



nals. You'll need to have a telephone installer look at your wiring to determine whether it meets StarLAN's cabling requirements.

StarLAN workstations access the network media using a CSMA/CD protocol derived from the Ethernet IEEE 802.3 standard protocol. The StarLAN protocol, recently adopted as an IEEE standard, is identical to the Ethernet protocol, except that it runs at 1–2 megabits per second over twisted-pair wiring (Ethernet runs at 10 megabits per second on coaxial cable). Workstations on networks using the CSMA/CD protocol must listen before they transmit data, waiting for the media to clear before transmitting data. If two stations transmit signals simultaneously, the signals collide. When the station detects these collisions, it retransmits the data. Although this protocol is efficient for transmitting many small messages or for lightly loaded networks, it becomes less efficient under very heavy loads because of increasing numbers of collisions and retransmissions.

**STARLAN SOFTWARE.** AT&T's StarLAN networking software is an adaptation of 3Com's networking software, which, in turn, uses a core of Microsoft's MS-NET networking software. (MS-NET is a series of networking software programs that hardware manufacturers and integrators license and modify to run their own networks.) 3Com added the programming



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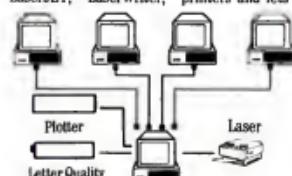
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## ■ AT&T'S STARLAN



If you use a bus connection scheme for StarLAN, the cables run from the out port of one card to the in port of the next. If you use the wiring hub, you connect the cable only to the out port. The telephone port on the interface card lets you connect a telephone to the StarLAN wiring, which contains two pairs of wires, one for voice and the other for data signals. In this way, you can cut down on the jungle of wires running from your desk to the wall.

code necessary in order for MS-NET to work with the Ethernet controller chip.

3 COM's 3+Share and AT&T's StarLAN use MS-DOS 3.1 or 3.2 as the operating system on the server. Despite its file-and-record-locking capabilities, DOS 3.1 is a single-user system running on a multi-user server. Either the application or the networking software, therefore, must include code that picks up where DOS 3.1's file-and-record-locking leave off. Specifically, when DOS 3.1 reports that a file is locked, the software must know how to recycle its request to access that file. In contrast, Novell's NetWare uses a true multi-user operating system (although its command structure looks like MS-DOS to users). Novell's operating system runs faster than DOS and manages file access for the applications.

**SOFTWARE SERVICES** Like other networking software, StarLAN's primary function is to move data between the network and the disk drives and to control data access and equipment sharing. In addition, StarLAN includes menus and utilities that make DOS functions easier to use, but it lacks the network diagnostics available in some other networking software packages.

StarLAN uses three separate programs, called services, to control data and equipment sharing: Administrative Service, File Service, and Print Service. These services

■ Like other networking software, StarLAN moves data between the network and the disk drives and controls data access and equipment sharing.

do a credible job of making up for the deficiencies in the single-user DOS 3.x operating system. StarLAN software allows multiple servers on the network to run the services. While servers can function simultaneously as workstations, we found this dual role practical only on lightly loaded networks.

StarLAN's Administrative Service allows the network administrator to control user access files and servers. If you need to



## FACT FILE

### StarLAN

AT&T Information Systems

1776 On-the-Green

Morristown, NJ 07960

(800) 247-1212

**Workstation Requirements:** 256 K RAM, one floppy disk drive, DOS 3.1 or higher.

**Server Requirements:** 512 K RAM, a hard disk drive.

**Networking Software:** AT&T's *StarLAN Network Program*, *Advanced NetWare/86*, *Advanced NetWare/286*.

**Prices:** 6300 Network Access Unit interface board, \$395; 300 feet of cable, \$23; 1,000 feet of cable, \$55; Active Link (fiber-optic board), \$375; Active Link (UPF) six-port passive hub for PC 200, \$1,295; four-port passive hub (for use with PC 300), \$100; eight-port active hub, \$885.

**In Short:** StarLAN is an easy-to-install, flexible network for future expansion, but the 6300 server is inadequate as a server, and the StarLAN software, while easy to use, is slow.

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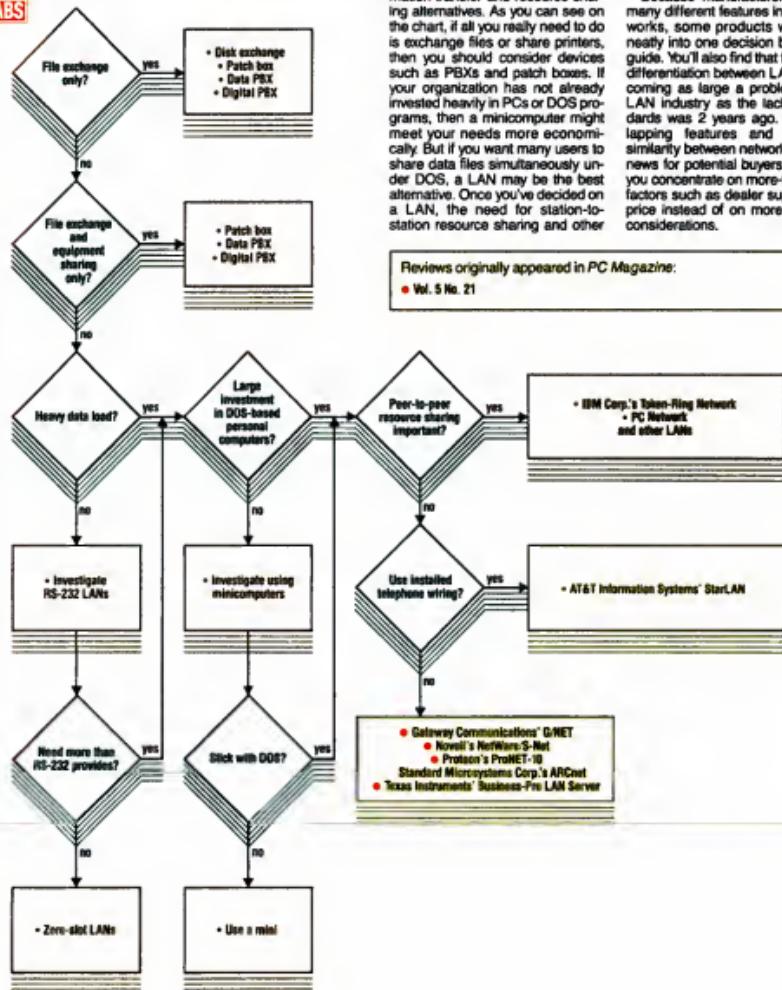


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A screenshot of the SYMDEB debugger interface. The window shows assembly code with labels like COUNT, PRIME, and COUNT2. It also displays memory dump information for registers and memory locations. A status bar at the bottom shows the current memory address and the word PTR to the memory location.

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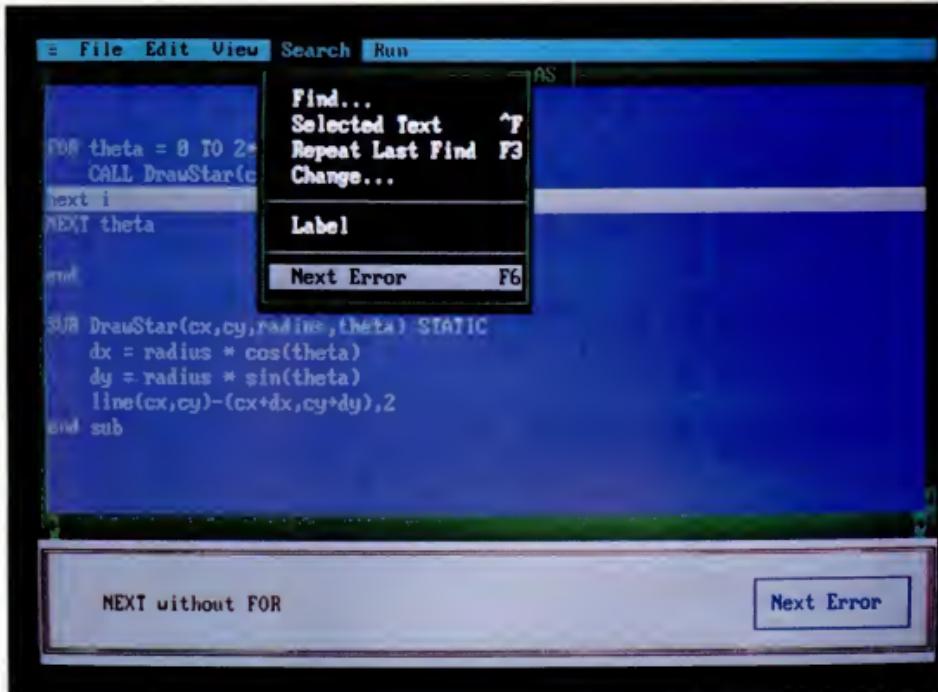
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# leaving BASIC for.

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- Built-in Editor that places the cursor on found errors automatically. NEW!
- Compile entirely in memory at speeds up to 6000 lines per minute. NEW!
- Link routines once when starting a programming session and no need to link again when changing programs. NEW!
- Built-in debugger with single-step, animate, and trace modes. NEW!
- Create stand-alone programs.

### Alphanumeric Labels

- Can be used to make your programs more readable. Line numbers are not required but are supported for BASICa compatibility.

### Structured Programming Support

- Block IF/THEN/ELSE/END IF eliminates the need for GOTO statements. NEW!
- Subprograms can be called by name and passed parameters. Both local and global variables are supported.

### Modular Programming Support

- Separate compilation allows you to create compiled BASIC libraries to use and re-use your programs.
- A library of routines to access DOS and BIOS interrupts is supplied. NEW!

### Large Program Support

- Code can use up to available memory.
- Numeric arrays, each up to 64K bytes, can use up to available memory. NEW!



## ■ AT&T'S STARLAN



### StarLAN: Summary of Features

PRODUCT/ Manufacturer/ Software	Installation		Network Administration			Features			Compatibility					
	Turnkey	Media-driven installations	Demonstration	Hours per month	Status reporting	Security	Workstation operables	Status-to-station file transfer	Printer spooling/ queuing	Peer-to-peer communications	Network sharing	Balk-resistant software	dBASE III Plus	Ribbon Series 5800
STARLAN AT&T Information Systems StarLAN Network Program	○	█	█	100	█	█	█	○	█	○	○	●	●	●
STARLAN AT&T Information Systems Advanced NetWare 286	○	█	█	1	█	█	█	○	█	●	●	●	●	●
NETWARE S-NET Novell Inc. Advanced NetWare 68	○	█	█	1	█	█	█	○	█	●	●	●	●	●
ARCNET Standard Microsystems Corp. Advanced NetWare 286	○	█	█	1½	█	█	█	○	█	●	●	●	●	●

**PC**—indicates Editor's Choice. ●—Yes ○—No

keep track of multiple servers, you use the Administrative Service to name them. You can give servers simple names (such as server 1, server 2, and so forth), geographical names (indicating their locations), or occupational names (such as accounting department, purchasing department, and so forth).

Using the Administrative Service, the network administrator gives each network user an identifying name that must be used to access files. You can specify up to three levels of names for each user, so that you can, for example, be identified by company, department, and your identifying name. In this way, StarLAN software paves the way for large hierarchical networks, with many servers linked together.

The network administrator can also specify groups, or categories, of users that can share certain common files using the Administrative Service. So, for example, as a member of a group called KEY-PUNCH, you could access specified common accounting files. When you sign on with your user name, the network operat-

**T**he features described in this table are determined largely by the networking software. For an in-depth discussion of the method we used to evaluate each feature, see "Meeting Connections: LANs and Networks," PC Magazine, Volume 6 Number 21. The StarLAN networking

### ■ The ability to group users, typical of good networking software, allows network administrators to control the group's access to a file.

ing system consults a table to determine your group memberships. The ability to group users, typical of good networking software, also allows network administrators to control the entire group's access to a particular file, without changing the software's profile for each group member.

The File Service manages file directo-

ries on the network. For each network user, the File Service creates a *home* directory, which functions as that person's personal root directory on the network. To use your home directory, you must establish a link between your username and the directory. DOS power users can employ the PATH command and enter a series of file specifications to link directories (such as those containing applications programs to those containing the data files) to users and to each other. Fortunately, StarLAN software also provides a utility called Sharename, which helps you simplify the linking procedure. Sharename acts like a macro, storing strings of commands and procedures for linking files. You activate the string by typing in the assigned share name.

Once a link is established, you can create, read, and write files as if the directory were on a local disk drive instead of on the server's drive. If you choose, you can also share your home directory and subdirectories with other users on the network. Shared directories usually include applica-

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## ■ AT&T'S STARLAN

tions programs, data files, electronic mail, and networking software files.

StarLAN's Print Service manages the three printers (two parallel and one serial) that can be attached to each server. The

Print Service assigns each printer its own share name. To choose one of the printers, workstation users execute a command through DOS or the networking software linking the printer share name to one of

their workstation's output devices, such as LPT1 or LPT2. When an applications program directs output to the workstation's output device, the network intercepts that output and routes it to the specified printer.

The Print Server queues print jobs and allows network administrators to prioritize users in the print queue so that, for example, work submitted by an executive secretary is always queued up for printing before work submitted by the accounts payable clerk. The administrator can also tell the Print Server to defer printing specified files, perhaps to wait until different paper has been loaded.

**MENUS AND UTILITIES** Like most other networking software packages, StarLAN software requires the network administrator to have a thorough knowledge of DOS. The various linking and sharing commands can be terse, and they leave no room for error. You will, therefore, spend a great deal of time creating and modifying DOS batch files to simplify network operation for workstation users. In particular, you should consider constructing batch files to automatically sign users onto the network.

StarLAN does include menus and utilities to help the network administrator. In addition to the Sharename utility mentioned above, StarLAN has a number of menus that act as a shell for the network, generating code in real time and passing commands to the networking software. These menus help you perform such functions as selecting servers, looking at file directories and subdirectories, and selecting printers. Network users with moderate networking skills can use these menus to move around the network. Power users can enter their own commands.

The StarLAN software provides a utility program that allows workstation users to create submenus individually tailored for them. You can, for example, use this utility to help users access specific applications programs. Again, you need a thorough knowledge of DOS to use this utility.

**USING THE SOFTWARE** You can install the StarLAN software almost as quickly as you can read this paragraph. One StarLAN disk holds the program that resides in the server, and a second contains

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## ■ AT&T'S STARLAN

the drivers that hide in each workstation's RAM. Although workstation users can modify the display, and the network administrator can change the size of different buffers or print queues and modify file pa-

rameters, the network installation involves little more than copying files.

AT&T deserves high marks for its documentation. The manuals, which include a glossary, table of contents, and an index,

are divided into sections for inexperienced users and for network administrators. AT&T deserves praise for including a quick reference guide. People trying to work their way through a network really need a quick reference, something few LAN software vendors provide.

**BENCHMARK TESTS** We tested the LAN with an AT&T 6300 Plus server (for a review of this machine, see *PC Magazine*, Volume 5 Number 4). To make the benchmark test evaluations of the StarLAN software directly comparable with the previous runs made using the StarLAN hardware and Novell's *NetWare*, we also ran the software on an IBM PC AT running at 8 MHz.

The benchmark test results are interesting. First, despite the overall positive reviews given to the AT&T 6300 Plus in *PC Magazine*'s review, the slow disk access on the 6300 (this network had the slowest benchmark test times) made it a poor choice as a server.

However, the 6300 itself wasn't completely to blame. The StarLAN software didn't set any records on the 8-MHz AT either. The relatively slow times are clearly not related to StarLAN's use of twisted-pair media or the operation of the network interface cards. These same cards and media set respectable times on the same AT running under Novell's *NetWare*. The StarLAN software is a lot slower than *NetWare* in all our network activity tests.

**BOTTOM LINE** Although the AT&T 6300 Plus is a nice standalone machine, it was inadequate as a server. In addition, we were unimpressed by the AT&T StarLAN software. While menus and excellent documentation make the software easy to use, the program's slow speed is a major drawback. The StarLAN software doesn't support the position of the product as a keystone in a larger information system architecture. As a result, Standard Microsystems' ARCnet hardware running under Novell's *Advanced NetWare/286* remains our Editor's Choice, because it is faster and resists degradation in heavily loaded environments.

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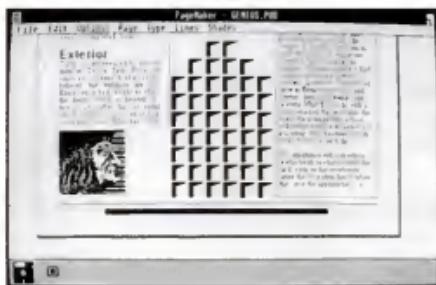
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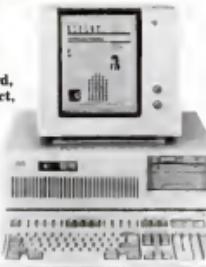
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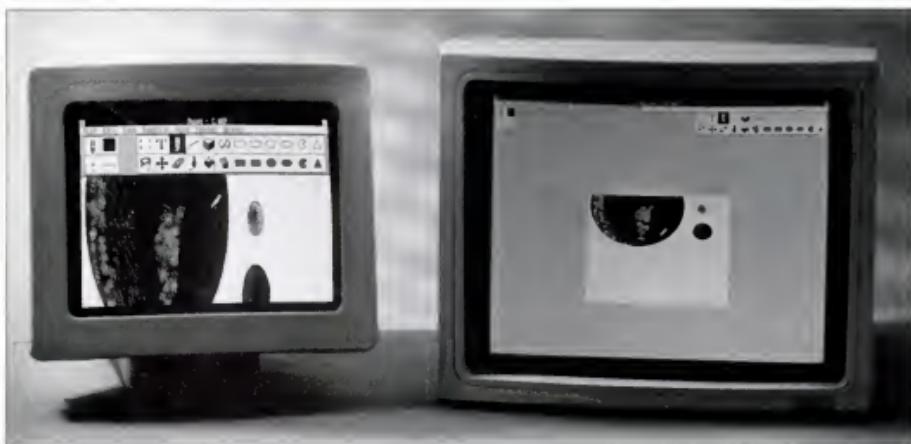
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Getting the most out of your PC is becoming more and more a matter of image. The latest power-packed generation of applications is increasingly image-oriented. The programs destined to push forward the frontiers of PC-based computing—desktop publishing and computer-aided drafting/engineering preeminent among them—all require display accuracy far beyond anything foreseen when

## ■ DISPLAY SYSTEMS



Wyse Technology's WY-700 monochrome display system (left) has a 15-inch screen and offers 1,280 by 800 resolution in black and white. Its active screen area is about 10 by 7½ inches. The screen stands on a tilting/swiveling pedestal base about 3 inches over the desk. The WY-700 can work by itself, replacing either the IBM color/graphics adapter, the

monochrome adapter, or both. The Viking I monochrome display system from Monitron Corp. (right) is a monster with its 19-inch screen. It has an active screen area of 14 by 11 inches and offers 1,280 by 960 resolution. The system is compatible with the IBM monochrome, IBM color/graphics, or Hercules graphics adapters.

the first PCs were designed. The demand is growing for bigger, sharper images that can reveal all the detail today's 80286-based microcomputers can handle.

Yet the IBM display standards for PCs rate hardly better than okay. While acceptable for such traditional applications as text processing, filing databases, and spreadsheet work, even the colorful images of the Enhanced Graphics Adapter pale in comparison with the pictures glowing on the screens of the dedicated graphics workstations that PCs now compete against. When compared to the sharply detailed images of a CAE system, the best of ordinary PC displays look as if a child drew them in crayon. Only a proud parent could take such bold, rough, clumsy sketches seriously.

A new breed of PC display systems that combine large, high-resolution monitors with specially designed display adapters promises to change the sorry state of PC screens. Boasting resolution ratings of over 1,000 lines horizontally, they claim to make images that rival the work of dedicated graphics systems. Their sole shortcoming is a lack of color. For reasons of

speed and cost, these systems restrict their images to monochrome, generally black and white.

The two highest-resolution systems currently available for attaching to PCs are Monitron Corp.'s Viking I and Wyse Technology's WY-700. Capable of quadrupling the number of pixels on the screen, these systems may change the way you look at your PC.

**WINNING SYSTEMS** Putting more resolution on your PC screen is more than just a matter of getting a new monitor. The

■ **Capable of quadrupling the number of pixels on the screen, these systems may change the way you look at your PC.**

quality limitations inherent in the IBM monochrome, color, and enhanced graphics displays arise from many design trade-offs that touch every part of the system. Higher resolution requires a monitor capable of displaying finer lines, more memory for storing the image information, and circuitry able to handle high-frequency video signals.

More memory is required because most advanced PC graphics display systems are bit-mapped. Every dot that appears on the screen has a separate place in memory assigned to it, ranging from a single bit in IBM's high-resolution color mode (which allows defining every dot on the screen as either on or off) to a full byte (which allows the wide selection of colors and brightnesses in EGA mode). Display systems that show more detail require a commensurate increase in memory.

Higher resolution also demands a wider-bandwidth signal to move the information from memory to the monitor. Because PCs and these high-resolution subsystems use raster displays that, like television signals, create their images by sequentially scanning hundreds of horizontal lines

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CIRCLE 174 ON READER SERVICE CARD

PC MAGAZINE ■ DECEMBER 23, 1986

## ■ DISPLAY SYSTEMS

across the face of the tube, every dot on the screen must be updated from memory dozens of times each second.

The number of times each dot on the screen is updated is called the refresh rate. Higher refresh rates help avoid screen flicker, and so the higher the refresh rate, the better. The IBM monochrome monitor uses a 50-Hz refresh rate, the color/graphics adapter, a 60-Hz rate. The refresh rate multiplied by the number of dots that must be displayed approximates the bandwidth required by the display system. Because the Viking I and the WY-700 display more than a million dots, they both require bandwidths in excess of 50 MHz, which is exotic territory, indeed, for PC displays.

The Viking I and the WY-700 display system take the same approach to the problems of high resolution. Both combine wide-bandwidth monitors and advanced display adapters that use large amounts of memory and higher-frequency capabilities. From that foundation, the systems go in separate directions, with different philosophies and widely different results.

**THE BEAUTY OF THE BEAST** The Viking I is an impressive beast to behold, if just for its size. Its 19-inch (diagonal) screen dwarfs ordinary displays, with an active image area of about 14 by 11 inches. Coupled with that huge screen is razor-sharp resolution, 1,280 by 960. The dot/aspect ratio of the Viking I is almost exactly 1 to 1 (it's 91/87 or 1.05).

The Viking I display uses P4 phosphors, which are a close match for the color of ordinary black-and-white television screens—the same eerie blue that lit living



## FACT FILE

### Viking I

Monitor Corp.  
5740 Green Circle Dr.  
Minnetonka, MN 55343  
(612) 935-4151

**List Price:** \$2,395

**In Short:** A high-resolution (1,280 by 960), 19-inch monochrome display system with a huge screen that dwarfs ordinary displays and works well with AutoCAD.

CIRCLE 686 ON READER SERVICE CARD

## ■ DISPLAY SYSTEMS

rooms across the nation during prime time a couple of decades ago. The display is noninterlaced. Each line is scanned sequentially from the top down, with a refresh rate of 66 Hz. The result is a sharp, stable image with no quivering or jitter, no matter what is on the screen.

To get all its dots from the display adapter to the screen, the Viking 1 is capable of handling a signal bandwidth of nearly 110 MHz, nearly ten times that of the ordinary IBM monochrome system. That number is more than just impressive to

### ■ The Emitter-Coupled Logic circuitry on the Viking 1 display adapter card consumes more electricity than an ordinary PC can supply.

consider: it's impossible to achieve with the standard NMOS and TTL circuits used in most of the PC.

Moniterm finds it necessary to use higher-speed Emitter-Coupled Logic (ECL), a more-expensive technology frequently employed in high-speed mainframe computers, in its display adapter. ECL is expensive for several reasons: the parts cost more, it also eats up a lot of power, and it generates a correspondingly large amount of heat.

In fact, the ECL circuitry on the Viking 1 display adapter card consumes more electricity than an ordinary PC can supply. Moniterm carefully sidesteps the power issue by supplying the card with most of the electricity it needs from the monitor. In addition to the video signal, the monitor carries the direct current required for the display adapter.

To operate this unique power system properly, you must switch the Viking 1 on before or at the same time as you turn on the computer that drives it. If the Viking 1 is left on when the host system is turned off, voltage will still be present in the Moniterm display adapter card, and so you

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## ■ DISPLAY SYSTEMS

must take particular care to be certain that the Viking 1 is off before you attempt to adjust the display adapter.

The display adapter runs somewhat warmer than most PC expansion boards, warm enough that an early version of the card smelled remarkably akin to a conflagration in the making. A recently revised Viking 1 display adapter has cut power consumption and the consequent heat buildup, but it still operates warmly.

In keeping with the aesthetics of current display design trends, a thin, inch-wide bezel surrounds the Viking 1's large face. The rest of the plastic case recedes straight back for about 4 inches, then shrinks like a

■ A revised Viking I display adapter has cut power consumption and the consequent heat buildup, but it still operates warmly.

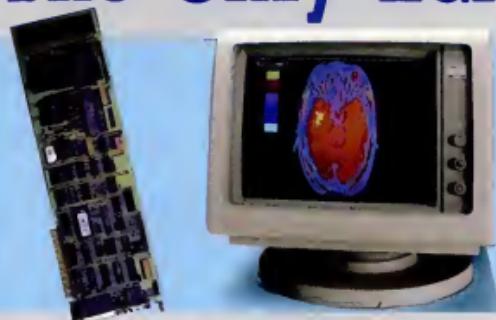
pyramid for a few inches. It ends with a large rectangular metal box (9 by 13 by 7 inches) that contains the bulk of the display's electronics. The styling makes most of what lies behind the screen invisible; so you see only the display and not the gray-beige of the case.

Two rubber feet are screwed into the bottom edge of the front bezel of the Viking 1, one on each side. Another foot projects down from the cubical electronics pod. This last foot is mounted at the end of a long, threaded shaft that you can screw in and out to set the display at a convenient vertical viewing angle.

Only one user control is provided, a plastic shaft at the back of the set to control the screen brightness. The control seems to operate backwards, turning counterclockwise to brighten the on-screen image.

**COOPERATIVE COWORKER** The Viking 1 display adapter works in conjunction with either an IBM monochrome, an IBM color/graphics, or a Hercules graph-

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## ■ DISPLAY SYSTEMS

ics adapter. It is not compatible with the IBM Enhanced Graphics Adapter. The output of the conventional adapter is fed into the Viking I adapter with a foot-long connecting cable, which is supplied with the system. The monitor is then plugged into the adapter.

The adapter is based on a huge VLSI chip, the Hitachi HD63484 ACRTC (Advanced CRT Controller), which uses a complete set of graphics primitives (drawing instructions) to create images rapidly.

### ■ Images from IBM monochrome and Hercules graphics adapters appear larger on the Viking screen but are exaggerated vertically.

Currently, little software is available to take advantage of the capabilities of this exotic chip.

To achieve compatibility with ordinary display modes and software that does not know about the Viking I's high-resolution abilities, the Viking has a special "frame-grabber" mode that captures the image being sent by the conventional display adapter, then adapts its signals to the Viking standard, and sends them to the display. Apparently the frame grabber works on a bit-for-bit basis. One dot from the IBM-style adapter is merely converted to one dot on the Viking I screen. For instance, each dot of the 640 by 200 CGA text display is mapped into the larger Viking screen and thus appears in a small section in the center of the tube.

Because the IBM monochrome and Hercules graphics adapters use a greater number of dots, their images appear larger on the Viking screen but are exaggerated vertically. In all cases, the frame-grabbed image is horizontally centered and starts at the top of the screen.

The translations that the frame grabber of the Viking I makes from color to monochrome certainly leave something to be de-

sired. All of the colors that have higher numbers in the IBM identification scheme (4 through 7, or red, magenta, brown/yellow, and white, respectively) are displayed as white whether or not they are in-

tensified. Lower-numbered colors are shown as black, again whether or not they are intensified. Thus bright white displayed on a red background becomes an illegible, continuous white.

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PC MAGAZINE ■ DECEMBER 23, 1986

## ■ DISPLAY SYSTEMS

The Viking I doesn't enter its element until you load software that takes advantage of its high-resolution abilities. However, only a small number of drivers are currently available. The unit that we reviewed came with three of these drivers: Lotus's 1-2-3, Microsoft Windows, and Autodesk's AutoCAD.

An alpha-test version of a full-screen DOS driver, which filled the entire face of the monitor with 50 lines of text, also accompanied the evaluation system. Although promising, the test version of this driver cannot handle programs that avoid DOS calls and write directly to screen memory.

Running AutoCAD with the Viking 1 will make an AT look and work like a dedicated engineering workstation—and with very good reason. For years Moniterm has been supplying displays to major manufacturers of CAD and CAE workstations, such as Sun Systems. The AutoCAD driver allows both white-on-black and black-on-white (reverse video) displays. If you operate in the reverse video mode, a black border nearly 2 inches wide will surround the active screen area.

The system reviewed operated in an AT with clock speeds of 8 MHz. In frame-grabber mode, it had no problem keeping up with the 12-MHz PC's Limited AT that I used for testing.

However, when running AutoCAD, the system crashed whenever the program started to draw on the screen at that high speed. At 6 MHz the problem did not occur. Setting up the system proved to be tricky, too. Moniterm recommends having



## F A C T F I L E

### WY-700

Wyse Technology  
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San Jose, CA 95134  
(408) 433-1000

List Price: \$999

In Short: A high-resolution (1,280 by 800), 15-inch monochrome display system with a high level of compatibility and a large number of supported applications, offering the lowest cost for high resolution in desktop publishing.

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## ■ DISPLAY SYSTEMS

### PROGRAMS COMPATIBLE WITH THE WY-700

One great advantage of the Wyse WY-700 monitor is compatibility. Here's a list of programs compatible with the WY-700 in high resolution, with the maker in parentheses.

#### Desktop publishing:

*Ventura Publisher* (Xerox Computer Services)

*PageMaker/PC* (Aldus Corp.)

*Frontpage* (Studio Software Corp.)

*DeskSet* (G.O. Graphics)

*PAGEmaster* (Advanced Vision Research)

*Rim System* (Telesis)

*Compound Document Processor* (Palantir Software)

*DisplayAd Makeup System* (Digital Technology International)

*Advantex* (Solution Technology)

#### Computer-aided design/engineering:

*AutoCAD* (Autodesk)

*Cadvance* (CalComp)

*In'a'Vision* (Micrografx)

*Generic CADD* (Generic Software)

*VersaCAD-Advanced* (T & W Systems)

*Workview* (Viewlogic Systems)

*Procad PC* (Procad Systems)

*P-CAD Systems* (Personal CAD Systems)

#### Graphics tools and utilities:

*Microsoft Windows* (Microsoft Corp.)

*GEM* (Digital Research)

*MetaWINDOWS* (Metagraphics)

*Dr. HALO II* (Media Cybernetics)

*GSS\*CGI* (Graphic Software Systems)

*KEE PC-HOST Delivery System* (Intellicorp.)

#### Other applications:

*I-2-3* (Lotus Development Corp.)

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EPSON-FX-988	\$549
EPSON EX-800	\$539
EPSON EX-1000	\$748

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## ■ DISPLAY SYSTEMS

another monitor on hand during setup.

Although the Viking 1 system displayed extremely sharp images when running with *AutoCAD*, the large screen size caused some noticeable jaggedness to ap-

pear when viewed up close. You will probably find that the most comfortable viewing distance for the Viking 1 will be somewhat greater than your usual distance from a normal text terminal.

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**A WHITE ONE FROM WYSE** Wyse Technology is mostly known as a terminal maker. The company arose from nowhere to become the self-proclaimed number two in the smart terminal market, lagging behind only IBM Corp. Its products are noted for being stylish and, since they are made in Taiwan, for their modest prices.

The WY-700 continues that tradition. The big, 15-inch (diagonal) tube is sur-

■ The screen resolution of the Wyse Technology WY-700 is razor sharp, with a maximum resolution of 1,280 by 800 in black and white.

rounded by a thin, 2-inch-wide pale gray-beige bezel, which hides the narrow rear portion of the case. The active screen area is about 10 by 7½ inches. The screen stands tall on a genuinely tiny tilting/swiveling pedestal base about 3 inches above the desk. The elegant appearance of the WY-700 gives the impression of a flat-screen display. The single user control, intensity or brightness, is a thumbwheel at the lower-right corner of the screen.

The dark face of the tube makes its paper-white P171 phosphors stand out in sharp contrast. If Wyse's choice of phosphors can in any way be criticized, it would be for the lingering green afterglow that takes a fraction of a second to fade completely from the screen when scrolling or erasing an image.

The WY-700 also has a small problem in keeping the brightness of its image constant. The more of the screen that is lit, the brighter each dot glows. When the full screen is illuminated in a simulation of reverse video, the background is brighter than text when the background is dark.

On the positive side, the screen resolution is razor sharp, with a maximum resolution of 1,280 by 800 in black and white and 640 by 400 using a four-step gray scale. The refresh rate is 69.4 Hz. The dot

## ■ DISPLAY SYSTEMS

aspect ratio is 1.2. Despite being interlaced, the WY-700 has no trouble delivering a rock-solid image.

The Wyse display adapter is a thick, two-layer board crammed with components that requires a full-length, XT-height expansion slot. Unlike the Viking I adapter, the Wyse works by itself and will substitute for either the IBM color/graphics adapter or the monochrome adapter, or

■ Compatibility is one of the Wyse's greatest virtues. Two jumpers select whether the Wyse will intercept signals meant for either of the standard IBM displays.

both. It can also be used in conjunction with one of the other adapters and its associated monitor, but because of memory conflicts it is not compatible with computers that have EGA systems installed.

**COMPLETELY COMPATIBLE** Compatibility is one of the Wyse's greatest virtues. Two jumpers select whether the Wyse will intercept signals meant for either of the standard IBM displays. The adapter automatically translates the intercepted images to fit the WY-700 screen.

The signal translation is superb. Color or monochrome text or graphic images fill the entire WY-700 screen (in black and white, of course). Even when the Wyse adapter is operating in its IBM color-compatible mode, its text display uses the same detailed characters (made from an array of 16 by 32 dots) the monochrome screen uses.

We found that the WY-700 is more successful than the Viking I in mapping of colors into black and white. The WY-700 displays the IBM color spectrum in three shades of gray. Black is left black, all non-highlighted colors are made medium gray,

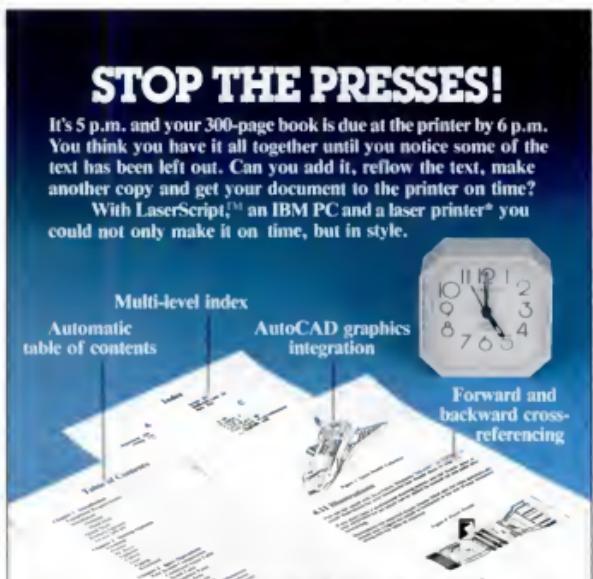
highlighted black (or dark gray) appears a darker gray, and all other highlighted colors become bright white. Some color combinations will disappear entirely, but bright characters against a dim background

remain quite readable.

Currently a modest but growing number of programs support the WY-700. These include several PC-based CAD systems, several desktop publishing pro-

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## ■ DISPLAY SYSTEMS

grams, Digital Research's GEM, Microsoft Windows' graphics environments, 1-2-3, and Symphony (see sidebar "Programs Compatible with the WY-700").

In addition to programming instructions

In addition to programming instructions in the thin but complete WY-700 manual, Wyse supplies several utilities to help you take advantage of all the capabilities of the system. One utility adds three text display

modes, allowing up to 50 lines of 160 characters each to be legibly shown on the monitor. Another utility clears these larger text screens, which the DOS CLS command does not always accomplish successfully.

Text fonts can be downloaded into the Wyse display adapter to substitute for the factory-furnished font that is normally used. Wyse provides a utility program for switching fonts but does not include any downloadable fonts. The company also supplies a screen-saving program that blanks the monitor after a user-selectable period of nonuse.

The only feature the system lacks is a hardware or software switch for selecting reverse video displays. Even when the screen is filled with characters with the reverse video attribute bit set, an ugly black border about  $\frac{1}{4}$ -inch wide encircles the screen. I hope that Wyse will be able to shrink the WY-700 display adapter down to a single board (or smaller) using custom VLSI chips.

**TOUGH CHOICE** The WY-700's large, sharp, nonflickering screen makes it a pleasure to use—even in its simple DOS compatibility modes or when you're sitting 6 feet away. Although the WY-700 does a top-notch job on CAD programs, it really comes into its element running desktop publishing software, where its paper-white screen takes on a familiar cast. And when running Windows on an AT, the WY-700 makes the Apple Macintosh look like a second-rate children's toy because of its screen's greater size and higher resolution and the AT's speed.

The Viking I and the WY-700 are not mutually exclusive. I was able to get both monitors operating on one AT-compatible system. I came to prefer the WY-700 for all text-based work and gave a slight edge to the Viking I when playing with AutoCAD. For all-around usefulness, however, the WY-700 wins easily with its superior DOS compatibility and greater number of supported applications. For desktop publishing, the WY-700 also offers the lowest-cost entry into a high-resolution screen display.

*Winn L. Rosch is a contributing editor of PC Magazine.*

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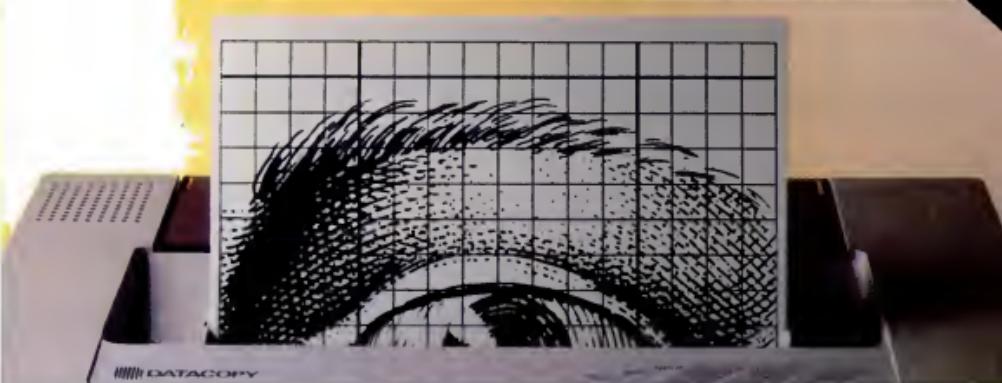
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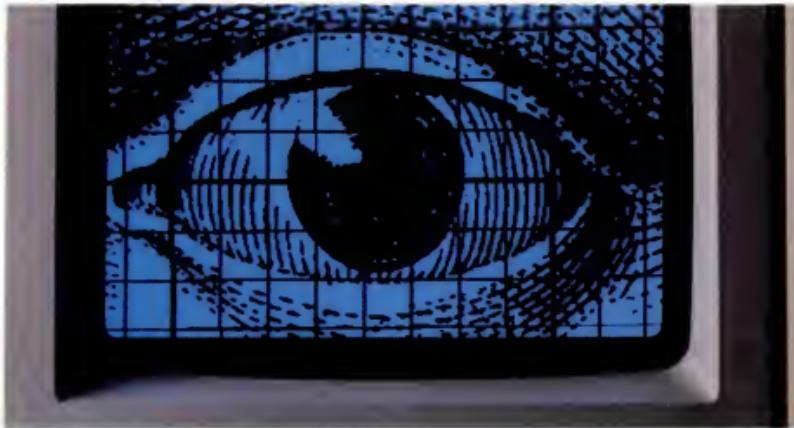


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■ PC LAB NOTES: ASSEMBLER ROUTINES IN BASIC ■ ETHAN WINER

# INTERFACING BASIC AND ASSEMBLER, PART 2

*Assembly language subroutines can add both speed and power to your BASIC programs. Here are some practical routines that will show you how.*

In Part 1 of this article (Volume 5 Number 21) I covered the basics of attaching assembler subroutines to BASIC programs, using a few short programs for illustrative purposes. In this concluding part we'll get to some more-practical examples, starting with a screen windowing program and ending with a complete sorting routine.

**WINDOWS** Calling the BIOS routines to clear and scroll windows is another natural application for adding assembler to BASIC. Indeed, there's just no reasonable way to do it in BASIC alone. The requisite assembly language subroutine, WINDO.ASM, is shown in Figure 1, and Figure 2 lists a demonstration BASIC program you can use to experiment with the window.

Windo relies on services 6 and 7 of BIOS interrupt 10h, and to use these services five variables must be passed. We will specify the upper-left row and column, the lower-right row and column, as well as a parameter that tells Windo whether to clear the screen or scroll it up or down.

Since the goal is always to make it as easy as possible for a BASIC program to interface with these routines, WINDO.BAS has been designed to handle rows numbered from 1 through 24, rather than the 0 through 23 the BIOS expects. The same goes for the columns—I through 80 are used instead of 0 through 79. PARAM% is coded as follows:

- PARAM% = 0 clears the window
- PARAM% = 1-24 scrolls the window up from 1 to 24 lines
- PARAM% = 256 + 1-24 scrolls the

window down from 1 to 24 lines.

The BIOS routines expect us to specify the rows and columns in the 8088's registers. In fact, Windo's major task is to get the parameters that were passed from BASIC and place them into the appropriate registers. Services 6 and 7 expect the row and column information as follows:

CH	= Upper-left row
CL	= Upper-left column
DH	= Lower-right row
DL	= Lower-right column
AL	= Number of lines to scroll (0 means clear window)
AH	= 6 means scroll up
AH	= 7 means scroll down

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Besides decrementing each of the registers to adjust the rows and columns to start numbering from 0 for the BIOS, notice the extra trick in Figure 1 that adds 600 hex to AX. Rather than require two different routines (one to scroll up and another to scroll down), the parameter that was passed from BASIC is manipulated to set AH (the high half of AX) to either a 6 or a 7. If PARAM% is 3 when Windo is called, adding 600h to it leaves AL equal to 3 and sets AH to 6, which scrolls up three lines. Had PARAM% been 256 + 3, AH would be set to 7, scrolling the same window down three lines.

**DISKINFO** Besides knowing the default drive, other information about a disk can often come in handy as well. For example, is drive C: a hard disk or a RAMdisk? Can it hold 20 megabytes or only 10? All of this and more is available by taking advantage of DOS service 36h.

Like Windo, several parameters must be passed to accommodate all of the information that DiskInfo will be returning. Specifically, the BASIC program will do a CALL DISKINFO(DRIVE%, BYTES%, SECTORS%, CLUSTERS%, TOTAL%), which are made available by an assembled version of Figure 3. DRIVE% is the ASCII code for the drive to check. DiskInfo then returns the remaining information as follows:

- BYTES% is the number of bytes contained in each sector (this is always 512 for PC-DOS)
- SECTORS% is the number of sectors in each disk cluster

## ■ PC LAB NOTES

```

Push BP      ;leave BP
Mov BX, BP    ;put stack address into BP
Mov SI, [BP+14] ;get UL.ROW% address
Mov CH, [SI]   ;put UL.ROW% value it into CH
Dec CH       ;adjust 1-24 to 0-23 for BIOS
Mov SI, [BP+12] ;get UL.COL% address
Mov CL, [SI]   ;put UL.COL% value it into CL
Dec CL       ;adjust 1-80 to 0-79
Mov BI, [BP+10] ;get LR.ROW% address
Mov DH, [SI]   ;put LR.ROW% value it into DH
Dec DH       ;adjust 1-24 to 0-23
Mov BI, [BP+8]  ;get LR.COL% address
Mov DL, [SI]   ;put LR.COL% value it into DL
Dec DL       ;adjust 1-80 to 0-79
Mov SI, [BP+6]  ;get PARAM% address
Mov AX, [SI]   ;put it into AL and AH
Add AX, 6000h  ;specify service 6 or 7
Mov BH, 7     ;color to use for clear or scroll
Int 10h      ;call BIOS to do it
Pop BP      ;restore BP
Ret 10      ;return to BASIC discarding vars

```

Figure 1: The assembler subroutine for WINDO.BAS (see Figure 2).

```

100'----- Windo.Bas
110'
120 MINDOS = SPACES(47)
130 FOR X = 1 TO 47
140    READ BYTES
150    RIDS(MINDOS, X, 1) = CHR$(VAL("A" + BYTES))
160 NEXT X
170 UL.ROW% = 5 : UL.COL% = 10  'specify location
180 LR.ROW% = 15 : LR.COL% = 70, 'of window
190 PARAM% = 6                   'scroll up six lines
200 CLS
210 FOR X = 1 TO 22
220    PRINT STRINGS(00, X + 64);
230 NEXT X
240 GOSUB 338
250 END
260'
270 DATA 55, 89, ES, BB, 76, EE, 8A, 2C, FE, CD, 8B
280 DATA 76, BC, 8A, BC, PE, C9, BB, 76, 8A, 8A, 34
290 DATA PE, 8A, 8A, 8A, 76, 8B, 8A, 14, PE, CA, 8B, 76
290 DATA 8A, 8A, 8A, 85, 88, 86, 87, 87, CD, 1E, 5D
310 DATA CR, 8A, 88
320'
330 X = VARPTR(MINDOS)
340 MIRDO = PEEK(X+1) + 256 * PEEK(X+2)
350 CALL WINDO(UL.ROW%, UL.COL%, LR.ROW%, LR.COL%, PARAM%)
360 RETURN

```

Figure 2: WINDO.BAS uses the assembler routine of Figure 1 for its data.

```

Push BP      ;leave Base Pointer
Mov BP, BP    ;put stack address
Mov SI, [BP+14] ;put address of DRIVE% into SI
Mov DX, [SI]   ;put DRIVE% data into DX (DL really)
Cmp DL, 0     ;is it 0 indicating default drive?
Jz Def        ;yes, jump over subtraction
Sub DL, 64    ;no, subtract 64 to make "A" = 1
Def:          ;specify service 36h
Int 21h      ;call DOS
Mov BI, [BP+12] ;put address of BYTES into BI
Mov [BI], CX   ;assign BYTES = register CX
Mov BI, [BP+10] ;address of SECTOR%
Mov [BI], AX   ;SECTOR% = AX
Mov BI, [BP+8]  ;address of CLUSTERS%
Mov [BI], BX   ;CLUSTERS% = BX
Mov BI, [BP+6]  ;address of TOTAL%
Mov [BI], DX   ;TOTAL% = DX
Pop BP      ;unlock BP for BASIC
Ret 10      ;return skipping all 5 parameters

```

Figure 3: The DISKINFO.ASM subroutine for Figure 4.

■ CLUSTERS% is the number of available clusters

■ TOTAL% is the total number of clusters on the disk

For this particular service, the drive will be placed into the DL register, and it is

specified slightly differently than before. Rather than use 0 for A, 1 for B, etc., DOS uses 0 to mean the current default drive. Therefore, drive A: will be indicated with a 1, drive B: with a 2, and so forth. We'll still accommodate BASIC by allowing

regular ASCII values to be used, though if the default drive is wanted, we must set DRIVE% to zero before calling DiskInfo. The assembly language code will then determine whether to subtract or not.

Figures 3 and 4 show the assembly and BASIC program listings respectively. Notice how the variable names are different for each of these programs, allowing them to be combined as necessary without having to worry about a conflict.

**GETDIR** Now let's see how string variables are accessed in assembly language. When IBM upgraded BASIC to take advantage of DOS 2.0, it included the CHDIR command to allow changing the

---

■ IBM's upgraded BASIC for DOS 2.0 included CHDIR to allow changing the current directory. But IBM left out a means to *read* it. From the DOS prompt it's easy: just enter CHDIR or CD with no argument, and DOS will "promptly" (sorry) oblige. Here's how to ask DOS from within BASIC:

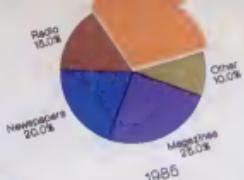
```

DIR$ = SPACES(64)
CALL GETDIR(DIR$)

```

DIR\$ returns holding the current directory name, though minus the drive indicator, colon, and leading backslash. It is important that DIR\$ be long enough to hold the returned information (up to 64 characters). GetDir checks the length of the string that is passed and will return to BASIC immediately if it is not at least that long. The complete assembler and BASIC programs for GetDir are shown in Figures 5 and 6, respectively.

GetDir uses DOS service 47h, which is nice enough to place a string representing the current directory wherever we tell it to.



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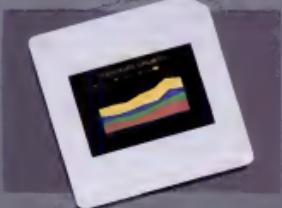
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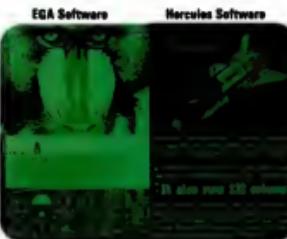
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```

188 '----- DiskInfo.Bas
189
190 INFO$ = SPACE$(44)
191 FOR X = 1 TO 44
192   READ BYTES
193   MID$(INFO$, X, 1) = CHR$(VAL("4H" + BYTES))
194
195 NEXT
196 DRIVER$ = $           'select default drive
197 BYTES = $             'must pre-assign all variables
198 SECTOR$ = $           'must pre-assign all variables
199 CLUSTERS = $          'must pre-assign all variables
200
201 TOTAL$ = 0
202 GOSUB 330            'get the disk information
203
204 PRINT USING "##,###,##0 bytes free";
205 BYTES * SECTOR$ * CLUSTERS
206 PRINT USING "##,###,##0 total disk space";
207 BYTES * SECTOR$ * TOTAL$
208 END
209
210 DATA 55, 89, E5, 8B, 76, 8E, 8B, 14, 8B, FA, 8B
211 DATA 74, 83, 8B, EA, 4B, 84, 3E, CD, 21, 8B, 76
212 DATA 8C, 89, 8C, 8B, 76, 8E, 89, 84, 8B, 76, 8B
213 DATA 89, 1C, 8B, 76, 8E, 89, 14, 5D, CA, 8A, 8B
214
215 X = VARPTR(INFO$)
216 DISK$ = PEK(E1) + 256 * PEK(E2)
217 CALL DISKINFO(DRIVER$, BYTES, SECTOR$,
218   CLUSTERS, TOTAL$)
219
220 RETURN

```

Figure 4: DISKINFO.BAS returns drive information using the Figure 3 subroutine.

```

Push BP      ; saves BP
Mov BP, BP    ; find stack
Mov SI, [BP+6] ; get address of DIR$ descriptor
Cmp Byte Ptr [SI], 64 ; is DIR$ long enough?
Jl Exit      ; no, get out now
Mov DI, [SI+1] ; get address of DIR$ data
Mov DL, 8     ; specify default drive
Mov AH, 47h   ; service 47h
Int 21h      ; call DOS
Pop BP       ; restores BP
Ret 2        ; return to BASIC; adjust stack

```

Figure 5: GETDIR.ASM shows how string variables are accessed.

```

188 '----- GetDir.Bas
189
190 GDIR$ = SPACE$(24)
191 FOR X = 1 TO 24
192   READ BYTES
193   MID$(GDIR$, X, 1) = CHR$(VAL("4H" + BYTES))
194
195 NEXT
196 DIR$ = SPACE$(64) 'set aside space for returned info
197 GOSUB 298
198 PRINT "Directory is \" DIR$"
199
200 END
201
202 DATA 55, 89, E5, 8B, 76, 8E, 8B, 3C, 4B, 72, 89, 8B
203 DATA 74, 81, 8B, 84, 47, CD, 21, 5D, CA, 82, 8B
204
205 X = VARPTR(GDIR$)
206 GDIR$ = PEK(X+1) + 256 * PEK(X+2)
207 CALL GETDIR(DIR$)
208
209 RETURN

```

Figure 6: The assembled GETDIR.ASM subroutine is used by GETDIR.BAS.

All the assembly language program has to do is put the address of the first character of DIR\$ into the SI register, and DOS will do the rest.

Just as all of the BASIC routines must first find the descriptor for the code string to be called and then track down the actual string data, GetDir must do the same for DIR\$. It's not a big deal, but it does take an extra step.

DOS doesn't use descriptors like those

in BASIC. Instead, it marks the end of a string with a CHR\$(0). If you wanted to get fancy, you could strip DIR\$ to the actual length needed after calling GetDir by using INSTR to locate this character:

```
DIR$ = LEFT$(DIR$, INSTR(DIR$, CHR$(0)) - 1)
```

And if you really wanted to get fancy, you could modify GetDir to allow a second parameter—drive. Like many of the DOS routines, service 47h will accept a

drive specifier in DL, though the GetDir program shown uses only the default drive.

**BASDIR** BasDir is a much more ambitious program than any that we've considered so far. BasDir will read all the filenames in a disk directory from any drive or path into a string array. Since it accepts all of the DOS wildcards, BasDir can even be used to read only certain groups of files. The assembly language program for BasDir is shown in Figure 7, and the complete BASIC program listing is contained in Figure 8.

An understanding of how string arrays are organized is essential to creating a program like BasDir, so if you don't already

■ When an integer array is dimensioned in BASIC, a contiguous area of memory large enough to hold all the elements is set aside.

know this, get set to learn.

When an integer array is dimensioned in BASIC, a contiguous area of memory large enough to hold all of the elements is set aside. For example, if you DIM X%(100), then 202 bytes are allocated, since each integer element occupies 2 bytes. (Unless you first set Option Base to 1, dimensioning an array to 100 means there will be 101 elements.) But the important thing to understand is that each element in the array is adjacent to the one just before it and just after it. When you ask BASIC for the VARPTR to X%(0), the address it returns is the beginning of this block of memory.

The concept is similar for strings; however, the area that is set aside contains a table of descriptors instead. As mentioned in Part 1, each string descriptor is 3 bytes long. It contains the length (1 byte) and address (2 bytes) of the string data to which it belongs. The strings themselves are stored

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## ■ PC LAB NOTES

```

;----- BASDIR.ASM retrieves directory information into a BASIC string array
Code    Segment
        Assume CS:Code, DS:Code, ES:Code
BssDir  Proc Far
        Dst 16h
        Dst BP      ;simulate Com program
        Push BP    ;leave BP for BASIC
        Mov  DF,BP   ;get stack address
        Mov  BX,[BP+6] ;set DTA service expects DTA address in DS:DX
        Mov  BX,DS   ;put DTA descriptor into BX also
        Add  BX,38   ;now point to start of file name area in DTA
        Mov  AH,1Ah   ;set DTA service
        Int  21h   ;call DOS to do it
        Mov  BF,BP   ;get stack address
        Mov  CX,[BP+6] ;get DOS address of FILE.NAMES() descriptor
        Mov  DI,[BX+1] ;DS:DX specifies search string at address DS:DX
        Mov  DS,[BX+1] ;find first matching file name service
        Mov  AH,43h   ;find first matching file name service
        Mov  CX,8     ;specify to search for only "normal" files
        Find_File: Mov  CX,8
        Int  21h   ;call DOS
        Cmp  AX,10   ;is DOS telling us there are no more files?
        Jne  Find_File ;if so, exit
        Add  BX,1L   ;BX = BX + 1L
        Add  BX,BF   ;BX = BX + BF
        Mov  DI,[BX+1] ;BX now points to file name area in DTA
        Mov  SI,BX   ;CX will track how many chars are transferred
        Mov  CX,12   ;CX = CX - 12
        Mov  CX,0     ;CX = CX + 12
        Mov  AH,4Ch   ;exit with error code 0
        Int  21h   ;call DOS
        Test AL,AL   ;check if there was an error
        Jne  End     ;if not, continue on to the next file name
        Je   BssDir  ;else that another character was transferred
        StosB CX    ;store character in CX
        Mov  AH,32   ;prepare to fill remainder of name with blanks
        Rep  StosB   ;using the count that remains in CX
        Mov  AH,4Fh   ;find next matching file name service
        Jmp  Find_File ;go do it again
        Add  BX,1L   ;BX = BX + 1L
        Mov  DI,[BX+1] ;BX now points to next descriptor
        Mov  DS,[BX+1] ;address of let char in next element into DS
        Mov  BX,Ptr [DI],# ;show that there are no more by putting a
                           ;CRHS(0) in last character of the next element
        Byte Ptr [DI],# ;exit, discarding the passed parameter
BssDir  Endp
Code    Endn
        Begin

```

Figure 7: BASDIR.ASM produces the machine code for the BASDIR.BAS program.

```

186 ;***** BASDIR.BAS - reads a disk directory into a string array
187 '
188 DIM FILE.NAMES$(200), DTA$(22)
189
190 BSSDIR$ = SPACES(76)
191 FOR X = 1 TO 76
192 READ X$;
193 MID$(BSSDIR$, X, 1) = CHRS(VAL("AH" + X$))
194 '
195 NEXT
196 FOR X = 1 TO 200
197   FILE.NAMES$(X) = SPACES(12)
198 NEXT
199 '
200 FOR X = 1 TO 200
201   FILE.NAMES$(X) = FILE.NAMES$(X) + CHRS(0)
202 '
203 COUNT = 0
204 FILE.NAMES$(0) = "*.*" + CHRS(0)
205 X = VARPTR(BSSDIR$)
206 BSSDIR$ = PEEK(X + 1) + 256 * PEEK(X + 2)
207 CALL BSSDIREDTA$(X), FILE.NAMES$(0)
208 '
209 COUNT = COUNT + 1
210 PRINT FILE.NAMES$(COUNT)
211 HEND
212 PRINT COUNT "File(s) Found"
213 '
214 DATA 55, 0B, BC, 0B, 56, 0B, DA, 03, C3, 1B, 04
215 DATA 1A, CD, 21, 0B, BC, 0B, 0B, 0B, 56, 0B, 04
216 DATA 0B, 74, 1C, 03
217 DATA C5, 03, 0B, 7B, 0B, 0B, 0B, 0B, 0B, 0B, 0B, 0B, 04
218 DATA 0B, 74, 0B, AA, 45, EB, F7, BF, 2B, F3, AA, 04
219 DATA 4F, ED, DA, 03, C3, 03, 0B, 7E, 01, C6, 05, 0B
220 DATA SD, CA, 04, 0B

```

Figure 8: BASDIR.BAS reads the filenames of a directory into a string array.

beginning at the top of BASIC's available memory; they grow downward toward the BASIC program and numeric variables.

What BasDir must do, therefore, is to find the start of this table of descriptors and locate each string, one by one, just prior to

placing the filenames there. To simplify calling from BASIC, the search criteria are placed in the lowest array element, and the names of each file on the disk are returned in subsequent elements. Notice that a CHRS(0) must be appended to the end of the search string. This is similar to the GetDrive procedure, where DOS marks the end of strings it returns with a zero byte. Without the CHRS(0), DOS would have no way of knowing where the string ended. As an example, to retrieve a list of all the BASIC programs in the \BASIC directory on drive C:, do this:

```

FILE.NAMES$(0) = "C:\BASIC\*.BAS" + CHRS(0)
CALL BASDIR(BSSDIR$, FILE.NAMES$(0))

```

While the correlate assembler code in Figure 7 is commented, a few words of additional explanation are in order. When a

---

■ There are many methods for allocating memory from within BASIC, but the easiest is simply to dimension a numeric array.

program asks DOS for information about a file or group of files, DOS requires a place in memory to put that information. This area is called the Disk Transfer Area, or DTA. It is up to the calling program to set aside this area just before it is needed by using (you guessed it) one of the DOS services.

There are many methods for allocating memory from within BASIC, but the easiest is simply to dimension a numeric array. Since the DTA requires 44 bytes of storage, BasDir uses an integer array dimensioned to 22 elements. Its starting address is easily found within the assembler routine using the normal methods, and then DOS is instructed to make that area of memory its DTA.

Besides the names of the files found, the full, normal DTA also contains other

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## ■ PC LAB NOTES

**COMPARING BASIC INTERPRETERS AND COMPILERS**

The current generation of BASIC compilers from IBM and Microsoft is extremely compatible with the interpreter. For the most part, you won't need to make changes to accommodate assembler routines, except when dealing with strings. The all-important difference is that in the compilers, strings may be as long as 32,767 characters, and therefore they use descriptors that are 4 bytes long. This means that any program—whether BASIC or assembler—must account for that fact when locating string data. The differences are outlined below.

Find a string in interpreted BASIC:

```
10 X = VARPTR(TEGTS)
20 LENGTH = PEEK(X)
30 UPTRT.ADR = PEEK(X+1) + 256*PEEK(X+2)
```

Find a string in compiled BASIC:

```
10 X = VARPTR(TESTS)
20 LENGTH = PEEK(X) + 256*PEEK(X+1)
30 UPTRT.ADR = PEEK(X+2) + 256*PEEK(X+3)
```

Similarly, an assembly language routine that locates a string must also take this into consideration.

Find a string in the interpreter:

```
Mov BX, [BX+6] ;get descriptor address
Mov CL, [BX] ;get its 1-byte length
Mov BX, [BX+2] ;get 2-byte starting address
```

Find a string in the compiler:

```
Mov BX, [BX+6] ;get descr addr from stack
Mov CX, [BX] ;get its 2-byte length
Mov BX, [BX+2] ;get 2-byte starting address
```

A big advantage of using compilers with assembly language is that external routines may be called by name, as opposed to absolute memory addresses. However, this requires using the Macro Assembler and Link programs, and a thorough discussion could easily fill a complete article.

As an example of locating a string both ways, we'll use the program UPS, which converts all of the characters in a string to uppercase. Complete programs to implement this routine are given for both the interpreter (Figure A) and for the compiler (Figure B).

Notice that the string is scanned backwards from the end. In assembly language, it is easier to see if zero has been

reached than any other number. The JS (Jump on Sign) instruction branches whenever the result of the last operation (DEC BX) causes a number to be negative.

reached than any other number. The JS (Jump on Sign) instruction branches whenever the result of the last operation (DEC BX) causes a number to be negative.

Also notice the extra step involved in getting the length of the string into BX. String lengths in the interpreter are only 1 byte long, but indexing requires the full register (2 bytes) to be used. If we could say [BL+SI] there would be no problem, but we can't. Therefore, even though we took only the single byte at [SI], we must still clear BH—the upper portion of BX.

To call the interpreted version of UPS, you would use

```
10 X = VARPTR(UPRS$)
20 UPS = PEEK(X+1) + 256*PEEK(X+2)
30 CALL UPS(X)
```

And to call the compiled version, you would use the somewhat different

```
10 X = VARPTR(UPRS$)
20 X = PEEK(X+2) + 256*PEEK(X+3)
30 IF X > 32767 THEN UPS = X - 65536
      ELSE UPS = X
40 CALL ABSOLUTE(XS, UPS$)
```

—Ethan Winer

```
;----- Ups-Int.Asm - for the interpreter
Push BP ;save BP for BASIC
Mov BP, SP ;get stack address
Mov SI, [BP+6] ;input descriptor address into SI
Mov BL, [SI] ;put length of string into BL
Mov BB, 0 ;must clear BB to use BX below
Mov SI, [SI+1] ;input address of string into SI
Next: Dec BX ;point to previous character
JS Exit ;was passed zero, all done
Cmp AL, [BX+SI] ;put current char into AL
Jb Next ;is it less than "a"?
Jg Next ;yes, go on to the next one
Cmp AL, "z" ;is it greater than "z"?
Ja Next ;yes, skip it
And AL, 5FH ;clear the "upper case" bit
Mov [BX+SI], AL ;poke char back into the string
Jp Next ;do the next one
Exit: Pop BP ;restores BP for BASIC
Ret 2 ;exit discarding string address
```

Figure A: UPS.ASM as written for use with an interpreter program.

```
;----- Ups-Cmp.Asm - for the compiler
Push BP ;save BP for BASIC
Mov BP, SP ;get stack address
Mov SI, [BP+6] ;input descriptor address into SI
Mov BX, [SI] ;input length of string into BX
Mov BB, [SI+2] ;input address of string into SI
Next: Dec BX ;point to previous character
JS Exit ;was passed zero, all done
Mov AL, [BX+SI] ;put the current char into AL
Cmp AL, "a" ;is it less than "a"?
Jb Next ;yes, go on to the next one
Jg Next ;is it greater than "a"?
Ja Next ;yes, skip it
And AL, 5FH ;clear the "upper case" bit
Mov [BX+SI], AL ;poke char back into the string
Jp Next ;do the next one
Exit: Pop BP ;restores BP for BASIC
Ret 2 ;exit discarding string address
```

Figure B: UPS.ASM prepared for use with a BASIC compiler.



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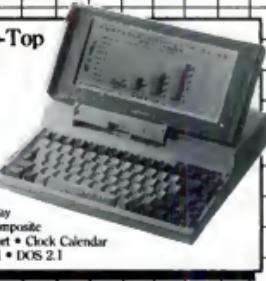
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## ■ PC LAB NOTES

## FUNCTIONAL DIFFERENCES: USR vs. CALL

Assembly language subroutines are usually accessed from BASIC with the CALL command, though there is one other way. The USR function, which has some advantages and disadvantages of its own, operates slightly differently.

Where CALL allows passing an unlimited number of variables to the assembler routine, USR allows only one. Further, the programmer is limited to ten separate USR functions at one time, and USR is slightly awkward in its implementation. It does, however, have the advantage of letting the external program determine whether the correct variable type has been passed to it. When a USR routine begins, the variable type passed

in the calling argument is made available for inspection in the AL register, with the meanings shown below.

AL = 2	integer argument
AL = 3	string variable
AL = 4	single precision
AL = 8	double precision

When a CALLED routine is executed, it has no way to determine this information and must assume that the programmer used the correct type. But USR has never really achieved great acceptance, probably because of its limit on the number of arguments.

USR functions are defined with the

DEF USR*n* statement, where *n* is a number between 0 and 9, and the address of the assembler routine is assigned to it. For example, if the UPS routine had been placed into the integer array UPS%(), it could be defined as a USR function like this:

```
DEF USR0 = VARPTR(UPS%())
```

Then, when a string was to be capitalized, the output of UPS could be accessed as shown below.

```
NEWS$ = USR0 (OLDS$)
```

Notice how USR, because it is a function, allows assigning its output directly. To accomplish the same thing with

data such as the file's date, time, and attribute. BASDIR.BAS doesn't bother with those and only uses the name, which starts at the 30th byte in the DTA.

The BP register keeps track of where we are in the table of descriptors; SI and DI are used as indices while each character is moved from the DTA into string storage; and BX holds the address of the DTA.

As each character is read from the DTA, it is examined to see if it is a CHR\$(0), in which case the end of the cur-

■ When there are no more names, DOS places an error code (18) in the AX register before it returns to the calling program.

rent name has been reached. BasDir then calls upon DOS to search for the next matching name. When there are no more names, DOS places an error code (18) in the AX register before it returns to the calling program. BasDir recognizes this and marks the first character of the next string

```
185 ***** MODEL.BAS
186
187 DIM ARRAYS$(5000)
188
189 PRINT "File to load and sort: "
190 LINE INPUT FS
191 SIZE = -1
192
193 OPEN FS FOR INPUT AS #1
194 WHILE NOT EOF(1)
195   SIZE = SIZE + 1
196   LINE INPUT #1, ARRAYS$(SIZE)
197 WEND
198 CLOSE
199
200 X = SIZE : Y = SIZE
201 Y = Y \ 2
202 IF Y = 0 THEN 368
203 S = X - Y
204 FOR PTR1 = S TO X
205   PTR2 = COUNT
206   PTR2 = PTR1 + Y
207   IF ARRAYS$(PTR1) <= ARRAYS$(PTR2) THEN 338
208   SWAP ARRAYS$(PTR1), ARRAYS$(PTR2)
209   PTR1 = PTR1 - Y
210   IF PTR1 > 0 THEN 208
211
212 NEXT
213 GOTO 238
214
215
216 FOR X = 0 TO SIZE
217   PRINT ARRAYS$(X)
218 NEXT
```

Figure 9: MODEL.BAS demonstrates the shell sort in BASIC.

Code	Segment	
	Assume CS:Code, DS:Code	
Sort	Proc Far	
	Org 188h	;simulate .COM program
Begin:	Push BP	;save BP for BASIC
	Cld	;set forward direction for string compares
	I	;below
	Mov BP,SP	get stack address (holds variable addresses)
	Mov BX,[BX+6]	input address of FILE into BX
	Mov AX,[BX]	input value of SFILE into AX
	Mov BX,[BX+8]	address of ARRAYS\$(0) descriptor into BX
	Call Continue	;push address of base onto the stack,
		;since this routine must be relocatable

(10 continues)

Figure 10: The assembler code to produce a shell sort subroutine.

CALL would require two steps.

```
NEWS = OLDS
CALL UPS(NEWS)
```

Similarly, printing a capitalized string could also be done in one step with

```
PRINT USR0 (X$)
```

Assembly language routines intended for access through a USR function must be designed slightly differently from their CALLED counterparts. When a string argument is being passed, the address of the string's descriptor is in the DX register. This makes things slightly easier for the programmer, since it eliminates having to deal with the stack.

But the convention for passing a numeric variable is totally different, and the assembler program never has access to its address. Instead, the value of the variable is placed into BASIC's Floating-point Accumulator (FAC), which is at a specific place in memory. Any changes made to the variable's value take place only in the FAC, so the programmer must assign the output of the USR function to a new variable if it is to be retained, as, for example

```
X = USR3 (Y)
```

Even if a USR function will not be doing anything to a variable, you must always include one. Further, some of BASIC's

built-in functions—such as POS (0)—also require a "dummy" value, which to me seems a nuisance.

USR is only minimally supported in the BASCOM compilers, and not at all in the latest release of Microsoft's QuickBASIC. When used with numeric variables in the BASCOM compilers, USR only allows integer values to be returned. The outgoing value of an assembly language routine must place that value in the BX register before exiting.

Since Microsoft has made it clear that QuickBASIC is the direction in which BASIC is heading, we should probably take this as an indication that USR is all but dead.—Ethan Winer

in the array, so the BASIC program can tell that it reached the end. This approach has the added advantage of not requiring the string array to be cleared each time BasDir is called, even if there are more names from a prior reading.

One important final note on using BasDir is that the BASIC program must not only dimension a string array large enough to hold all of the expected files, but each string in the array must also be

---

■ No collection of assembly language add-ons would be complete without including a sorting routine.

---

predefined. An external assembly language routine cannot dimension or create variables, and failure on your part to do so will guarantee a crash!

**SORT** No collection of assembly language add-ons would be complete without a sorting routine, since this is an area

```
base    IM   ?           ;[BP] holds base address of ARRAY$(0)
X      DM   ?           ; descriptor
Y      DM   ?           ;[BP+02]
Z      DM   ?           ;[BP+04]
Count  DM   ?           ;[BP+06]
Ptr1  DM   ?           ;[BP+08]
Ptr2  DM   ?           ;[BP+10]
BP    DM   ?           ;[BP+12]

Continua: Pop BP          ;BP now holds address of Base - all future
            Mov [BP],BX          ; variable references will be relative to BP
                           ; save address of ARRAY$(0) descriptor

Line_220: Mov [BP+2],AX    ;X = $IZE
          Mov [BP+4],AX    ;Y = $IZE
Line_230: Mov AX,[BP+4]    ;Y = Y \ 2
          Shr AX,1
          Mov [BP+4],AX

Line_240: Test AX,AX      ;IF Y = 0 THEN 368
          Jns Line_250
          Jmp Line_360

Line_250: Mov AX,[BP+2]    ;Z = X - Y
          Sub AX,[BP+4]
          Mov [BP+4],AX

Line_260: Mov Word Ptr [BP+0],#  ;FOR COUNT = 0 TO Z
Line_270: Mov AX,[BP+0]    ;PTR1 = COUNT
          Mov [BP+0],AX

Line_280: Mov AX,[BP+10]   ;PTR2 = PTR1 + Y
          Add AX,[BP+4]
          Mov [BP+12],AX

Line_290: Mov AX,[BP+10]   ;get PTR1 element number
          Mov BX,3             ;using three bytes per descriptor,
          Mul BX,2             ; calculate offset into the descriptor pool.
          Add AX,[BP]           ;offset + base = addr of ARRAY$(PTR1)
                           ; descriptor
          Mov BX,AX
          Mov BL,[SI]           ;put descriptor address into BX
          Mov BL,[SI]
          Cmp BL,0              ;is it a null string?
          Je Line_330           ;yes, it must be <= ARRAY$(PTR2), so don't swap
          Mov CX,SI              ;save address in case we need to swap later
          Mov SI,[SI+1]           ;now SI points to let character in ARRAY$(PTR1)

          Mov AX,[BP+12]          ;get PTR2 element number
          Mov BX,3                ;same as above
          Mul BX,2
          Add AX,[BP]
```

(10 continues)

## PC LAB NOTES

```

Mov    DI, AX
Mov    BX, [DI]
Cmp    BH, #01
Jz     Sweep2 ;if the length is zero it must be less, so swap
Mov    DX, DI
Mov    DI, [DI+1]

Next_Cher: Lodsb          ;get the current character in ARRAY$(PTR1)
Cmp    AL, [DI]           ;compare it to current character in
                          ;ARRAY$(PTR2)
Jb     Line_33B           ;ARRAY$(PTR1) is "smaller", skip over swap
Je     Sweep              ;otherwise swap them, swap 'em
Dec    BL
      ;move DI equal as far, but see if we're past
      ;the end of either string
Jz     Line_33B           ;yes, ARRAY$(PTR1) must be less or equal
Dec    DI                  ;skip end of ARRAY$(PTR2)?
Jz     Sweep              ;yes, ARRAY$(PTR1) must be greater, swap them
Inc    DI                  ;increment DI to keep up with SI
Jmp    Next_Cher          ;keep checking

Swap:  Mov    DI, DK          ;retrieve pointer to ARRAY$(PTR2) descriptor
Swap2: Mov    SI, CX          ;ditto for ARRAY$(PTR1)
        Mov    AL, [SI]           ;get length byte of ARRAY$(PTR1)
        Mov    AH, [DI]           ;send length byte of ARRAY$(PTR2)
        Mov    DL, AL             ;swap them
        Mov    BH, #01
        Mov    AX, [SI+1]         ;get address word pointing to ARRAY$(PTR1) dest
        Mov    BX, [DI+1]           ;send address word pointing to ARRAY$(PTR2) dest
        Mov    [DI+1], AX          ;swap them too
        Mov    [SI+1], BX

Line_31B: Mov    AX, [BP+18]       ;PTR1 = PTR1 - Y
Sub    AX, [BP+4]
Mov    [BP+18], AX

Line_32B: Cmp    Word Ptr [BP+18], 0 ;IF PTR1 > 0 THEN 288
Jg     Line_288

Line_33B: Inc    Word Ptr [BP+0]       ;NEXT
Mov    AX, [BP+0]
Cmp    AX, [BP+6]
Je     Line_34B
Jmp    Line_278

Line_34B: Jmp    Line_23B          ;GOTO 23B

Line_36B: Pop    BP
Ret    4

Sort   Endp

Code   Ende
End.  Begin

```

(Figure 10 ends)

```

100' ***** SRLDORT.BAS *****
101
102 DIM ARRAY$(5000)
103 SORTS = SUCCE9(231)
104 FOR X=1 TO 5000
105     READ BYTES
106     MID$ (SORTS,X,1) = CHR$(VAL("AH" + BYTES))
107 NEXT
108
109 PRINT "File to load and sort: "
110 LINE INPUT #5
111 SIZES = -1
112                                     'include ARRAYS(B)
113
114 OPEN FS FOR INPUT AS #1
115 WHILE NOT EOF(1)
116     LINE INPUT #1
117     SIZES = SIZES + 1
118     LINE INPUT #1, ARRAYS(SIZES)
119 WEND
120 CLOSE
121
122 FOR X=1 TO SIZES
123     X = VARPN(SORTS)
124     SORT = PEEN(X+1) + 256*PEEN(X+2)
125     CALL SORTABND$ (START1, SIZES)

```

```

330 FOR X = 0 TO SIZEX
335   PRINT ARRAYS(X)
340 NEXT X
345
350 DATA 55, FC, BB, BC, BB, 5E, #6, BB, 87, BB, 5B, BB
355 DATA #8, BB, BB, BB, BB, 89, BB, BB, BB, 89, BB, BB, BB
360 DATA #8, BB, BB, BB, BB, 89, BB, 5D, BB, 5B, #89, 46, EC, BB
365 DATA 89, 46, FA, 89, 46, FA, D1, BB, 89, 46, FA, 89, 46, EC
370 DATA C9, 75, #89, 59, #89, BB, 46, #89, 28, 46, EC
375 DATA #9, 46, BB, C7, 46, BB, #89, 89, 46, EC, BB
380 DATA 46, BB, FA, 46, BB, #89, 46, FA, 89, 46, EC, BB
385 DATA 89, 46, FA, 89, 46, FA, 89, 46, EC, BB, #89, 46, EC
390 DATA 8A, 1C, BB, 89, 74, 46, BB, 74, 46, BB, 74, 46, BB
395 DATA #F, BB, 89, 74, 46, BB, 74, 46, BB, 74, 46, BB
400 DATA #F, BB, 89, 74, 46, BB, 74, 46, BB, 74, 46, BB
405 DATA #F, BB, 89, 74, 46, BB, 74, 46, BB, 74, 46, BB
410 DATA #F, BB, 89, 74, 46, BB, 74, 46, BB, 74, 46, BB
415 DATA #F, BB, 89, 74, 46, BB, 74, 46, BB, 74, 46, BB
420 DATA #F, BB, 89, 74, 46, BB, 74, 46, BB, 74, 46, BB
425 DATA #F, BB, 89, 74, 46, BB, 74, 46, BB, 74, 46, BB
430 DATA #F, BB, 89, 74, 46, BB, 74, 46, BB, 74, 46, BB
435 DATA #F, BB, 89, 74, 46, BB, 74, 46, BB, 74, 46, BB
440 DATA #F, BB, 89, 74, 46, BB, 74, 46, BB, 74, 46, BB
445 DATA #F, BB, 89, 74, 46, BB, 74, 46, BB, 74, 46, BB
450 DATA #F, BB, 89, 74, 46, BB, 74, 46, BB, 74, 46, BB
455 DATA #F, BB, 89, 74, 46, BB, 74, 46, BB, 74, 46, BB
460 DATA #F, BB, 89, 74, 46, BB, 74, 46, BB, 74, 46, BB
465 DATA #F, BB, 89, 74, 46, BB, 74, 46, BB, 74, 46, BB
470 DATA #F, BB, 89, 74, 46, BB, 74, 46, BB, 74, 46, BB
475 DATA #F, BB, 89, 74, 46, BB, 74, 46, BB, 74, 46, BB
480 DATA #F, BB, 89, 74, 46, BB, 74, 46, BB, 74, 46, BB
485 DATA #F, BB, 89, 74, 46, BB, 74, 46, BB, 74, 46, BB
490 DATA #F, AC, 3A, #89, 52, 34, 77, #89, BB, FA, BB, #F, BB
495 DATA #F, FA, 89, 74, 46, BB, 74, 46, BB, 74, 46, BB
500 DATA #F, FA, 89, 74, 46, BB, 74, 46, BB, 74, 46, BB
505 DATA #F, FA, 89, 74, 46, BB, 74, 46, BB, 74, 46, BB
510 DATA #F, FA, 89, 74, 46, BB, 74, 46, BB, 74, 46, BB
515 DATA #F, FA, 89, 74, 46, BB, 74, 46, BB, 74, 46, BB
520 DATA #F, FA, 89, 74, 46, BB, 74, 46, BB, 74, 46, BB
525 DATA #F, FA, 89, 74, 46, BB, 74, 46, BB, 74, 46, BB
530 DATA #F, FA, 89, 74, 46, BB, 74, 46, BB, 74, 46, BB
535 DATA #F, FA, 89, 74, 46, BB, 74, 46, BB, 74, 46, BB
540 DATA #F, FA, 89, 74, 46, BB, 74, 46, BB, 74, 46, BB
545 DATA #F, FA, 89, 74, 46, BB, 74, 46, BB, 74, 46, BB
550 DATA #F, FA, 89, 74, 46, BB, 74, 46, BB, 74, 46, BB

```

where BASIC really bogs down. I have chosen the Shell Sort algorithm over Quick Sort because of its two attractive characteristics: it is nearly as fast, and it is infinitely simpler to implement.

The program MODEL.BAS, shown in Figure 9, implements the Shell Sort technique in BASIC. Figure 10 contains the assembler routine that will be used as DATA by the final SHELRSORT.BAS program (Figure 11). The use of line numbers from MODEL.BAS as labels and the extensive comments in SORT.ASM (Figure 10) should be a help if you're new to assembly language.

Two parameters are passed to Sort: the starting element of the string array, and the size to which it was originally dimensioned. Sort will order the array many times faster than would ever be possible in BASIC, and, like BasDir, it uses registers extensively to keep track of the descriptors that must be handled. Only one unusual trick is used, and that relates to the local variables that Sort needs to do its work.

Because there is no way to know the final addresses of these programs ahead of time, all of the assembler routines must be designed to be relocatable. This means that all jumps and calls within a program have to be relative to the current memory location, regardless of where that may be. Normally this is not a problem—the 8088 generally works like that, anyway. However, the storage of data is never relative and must always be specified exactly. Therefore, the trick is to have the program determine

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mine its own address, before any internal variables are used.

In Part I I discussed the use of the stack for passing variable addresses between programs. Another important use of the stack is to retain the address of a calling program, so the 8088 will know where to return to later. Whenever a call is performed, the 8088 automatically places the address of the next instruction on the stack.

This feature is exploited by Sort and occurs in the line that calls the label Continue. In this case we're not actually calling anything—we're just jumping over the data storage area. But when the program arrives at Continue, the address whence it came is conveniently there for us on the stack—we just need to POP it off. In fact, if we didn't, when we finally tried to return to BASIC, there would be a fine mess!

By placing this address into the BP register, all of the variables that Sort needs can be addressed with the familiar instructions BP+2, BP+10, etc. Thus, as you compare the assembly listing or SORT.ASM with that of the BASIC MODEL.BAS, observe how the variables are manipulated and compare the various instructions with their BASIC equivalents. And, as a quick test, run each of the two .BAS sort programs on any file you wish. If you haven't got a vast array of programs you would like to sort alphabetically, you could even sort your AUTOEXEC.BAT, though this will probably be too short to show much of a difference in speed between MODEL.BAS and SHELRSORT.BAS. (Needless to say, you shouldn't later try to use the alphabetically sorted version as your AUTOEXEC.BAT file.)

I hope, however, that by showing how these assembly language routines are constructed and attached to BASIC, you will have a greater understanding of all of the resources at your disposal. As you can see, there is nothing magical or mysterious about assembly language, and in many ways it is nearly as straightforward as BASIC. I would also like to encourage you not only to use these programs as is, but to study them, change them, and—most important—use them as a basis for developing your own BASIC extensions.

Ethan Winer, an independent consultant, is the head of Crescent Software.

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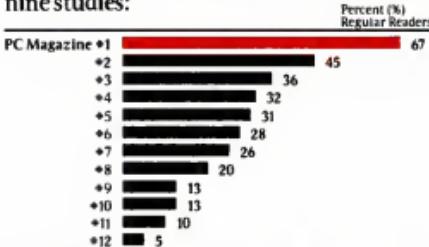
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# FREEZE OUT FILE FILCHERS



*When you need to leave a running PC full of confidential information, here's the way to give snoopers the cold shoulder.*

**F**ile security is an important consideration these days—especially with microcomputers, whose files are more accessible than those of their mainframe counterparts. Only by going to great lengths can you restrict access to files stored on your hard disk through any software scheme, and any means of protection implemented solely through software is arguably not 100 percent foolproof. Probably the most reliable way to hide files from prying eyes is to encrypt them using any one of a number of file encryption utilities.

But what happens when you have to leave your desk or office for a few minutes while you're working with a confidential file? Chances are that if you expect your absence to be brief, you won't take the time to save the data, exit the application, and encrypt the newly saved file. The effort required is simply disproportionate to the short length of time you expect to be away. So you accept the security risk.

**FREEZE** provides a quick and more reasonable alternative. **FREEZE** is a compact, memory-resident utility that lets you suspend program execution and blank the screen instantly, type in a password, and then leave your PC operationally locked solid until you enter the same password again. Even Ctrl-Alt-Del won't work: there's no way to unfreeze the computer without duplicating the password short of flipping the power switch off and back on. And since you can enter a different password at the beginning of each lockdown, there's nothing stored on disk where a clever prier could find it. **FREEZE** lets you quickly and easily hide currently active

data just as you might protect data saved in files, only without the bother.

**USING FREEZE** You load FREEZE once at the beginning of a session; a line in your AUTOEXEC.BAT file is the easiest way. Trying to load the program a second time will produce an error message. When loaded, FREEZE attaches itself invisibly to the operating system and simply waits to be called. You invoke it, at any time, by pressing the Alt-NumLock key combination. The video display immediately goes blank, and you type in a password or

phrase (up to 64 characters in length), terminating it with the Enter key. The PC will then be frozen until you enter the same password again.

While you are entering a password, the Backspace key remains active as an editing key. Characters are not echoed to the screen as you type—a traditional safeguard lest someone sneak a peek over your shoulder. If you change your mind about locking up your computer while entering a password, simply press the Esc key. The display will be restored, and you'll drop right back into the application program.

```

;FREEZE.COM for the IBM Personal Computer - 1986 by Jeff Proeise

; kb_data      equ 68h          ;keyboard data port
; kb_ctrl     equ 11h          ;keyboard control port
; numlock_key   equ 69          ;scancode of Numlock key
; del_key      equ 83          ;scancode of Del key
; alt_key      equ 86          ;shift code for Alt key
; ctrl_key     equ 4           ;shift code for Ctrl key
; esci         equ 28h          ;send-of-interrupt signal
; int_ctrl_port equ 28h          ;$259 interrupt controller port

; bios_date    segment at 48h      ;BIOS date area
; bios_date    org 63b
; addr_6845    dw ?             ;address of 6845 index register
; bios_date    ende

; code         segment para public 'code'
; assume cs:code
; org 100h

begin:    jmp initilize           ;goto initialization routine

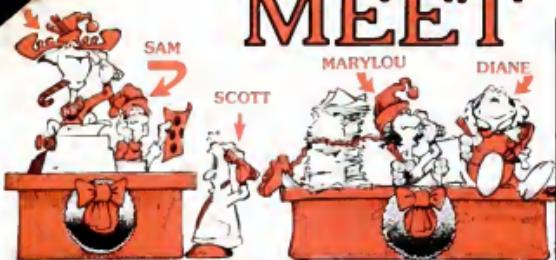
; adapter      db 8             ;# = VGA, I = CGA or MDA
; freeze_status db 8             ;interrupt routine status flag
; cher_count    db ?             ;length of password
; mer_address   dw ?             ;address of Mode Select Register
; mer_values    dw 2Ch,28h,2Dh,29h ;Mode Select Register values to
;                   dw 2Ah,2Bh,1Kh,29h ;re-enable CGA/MDA video display
; ibm_sigatures db 'IBM'        ;IBM BIOS signature
; ermess        db 13,18,'Freeze Already Loaded',13,18,'$'
; copy_right   db 13,18,'Copyright 1986 Iff-Dewie Publishing Co.',13,18,'$'

; old_int_9h    label dword       ;holding area for INT 9h vector
; int_9h_per    dw 2 dup (?)    ;label dword
; old_int_16h   label dword       ;holding area for INT 16h vector
; int_16h_per   dw 2 dup (?)

;
```

**Figure 1:** The assembler code for FREEZE

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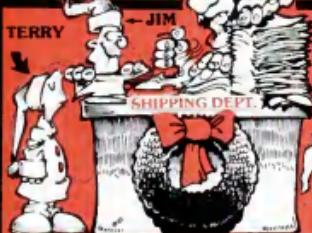
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## ■ PROGRAMMING/UTILITIES

where you left off. After the first password has been entered, however, the freeze can be ended only by reentering the password. So don't forget the keyword you typed—it's your only means of getting back to the data you left.

Except for Esc and Enter, any key or combination of keys that normally places a character in the keyboard buffer can be used in your password. That includes unusual combinations created by using the Alt or Ctrl keys. Indeed, using them is a good way to decrease the chance of anyone duplicating your password by accident. You might, for example, give your password a twist by typing its final letter with the Alt key pressed. Another sneaky trick

**■ If you forget the password, your only recourse is a full power-off reset, which will wipe out your RAM-resident data.**

would be to imbed a press of, say, the PgDn key somewhere in the middle of the key word. Just remember to type it exactly the same way the second time.

While reentering the password, you can again use the Backspace key to delete the character to the left of the invisible cursor. Similarly, pressing Esc clears the password buffer and positions the imaginary cursor back to the beginning of the input line. Pressing Enter tells the computer to compare the keyword just entered to the first one entered. If the two match exactly, control is returned to the program that had been temporarily interrupted; if they don't match, the freeze remains in effect and the imaginary cursor is again homed to the beginning of the input line for you to try again. If you forget the password, your only recourse is a full power-off reset, which will wipe out all your RAM-resident data.

The source code for FREEZE is shown

```
;All calls to INT 16h will henceforth be routed thru here. If AH = 255 on
;entry, BH is set to 255 to signal the caller that this routine was indeed
;invoked.
;
new_int_16h proc near
    cmp ah,255
    jna newint1
    mov bh,ah
    int 16h
    jc newold_int_16b
    jmp new_int_16h
;
;Execution comes here every time an interrupt 9 is generated from the keyboard.
;
freezes proc near
    sti                                ;restores interrupts
    push ax                            ;saves registers
    push bx
    push cx
    push dx
    push si
    push di
    push es
    in al,kh_data                      ;read keypress (or break)
    and al,7fh                         ;strip the break bit
    cmp freeze_status,F                ;freeze routine currently active?
    ja freezeal
;
;The freeze routine is already in progress. Check for a press of Ctrl-Alt-Del
;and block it out if it just occurred.
;
    cmp al,del_key                   ;was the Del key pressed?
    jne exit1                          ;no, then goto old INT 9 routine
    mov ah,2                           ;INT 16h - get shift status
    int 16h                           ;get status of shift keys
    and al,alt_key+ctrl_key           ;Ctrl-Alt pressed?
    cmp al,alt_key+ctrl_key           ;no, then goto old INT 9 routine
    jne exit2                          ;Ctrl-Alt-Del pressed - reset kb
    call kh_rssat
    jmp unfrel
;
;The freeze routine is not already active. See if Alt-NumLock was pressed.
;
freezeal:   cmp sl,numlock_key        ;is it the NumLock key?
    jne exit1                          ;no, then goto old INT 9 routine
    mov ah,2                           ;INT 16h - get shift status
    int 16h                           ;get current status of shift keys
    test al,alt_key                  ;is the Alt key pressed?
    jne freeze2
    jmp freezeal
;
;Exit routine restores registers before exiting thru the normal keyboard
;interrupt handler.
;
exit1:      pop es                            ;pop registers off stack
    pop ds
    pop di
    pop si
    pop bx
    pop cx
    pop px
    pop ax
    jmp old_int_9h                    ;exit to normal interrupt handler
;
;Trigger keys are pressed. Reset the keyboard, send an EOI signal to the 8259,
;and execute our freeze routine.
;
freeze2:   call kh_reset
    mov freeze_status,1
    push cs
    pop px
    push cx
    pop si
    assume ds:code
;
;Begin freeze routine by disabling video and getting a password from the user.
;
    call video_disable               ;disable video display
    xor di,di                        ;point DI to start of PSP
    call get_password                ;get the password
    or cs,cs                          ;any characters input?
    je unfreeze                      ;no, then exit interrupt routine
    cmp al,2f
    jne unfreeze
    mov char_count,cs                ;reset input terminated with ESC key?
    jc unfreeze
    jmp unfreeze
;
;The password is now entered and the keyboard 'frozen', awaiting input of a
;matching password. Accept input from the keyboard but continue to loop until
;the password is correctly re-entered.
;
```

(Figure 1 continues)

## DOWNLOADING FREEZE

The programs that appear in our Programming/Utilities column (as well as the other programs we publish) can be downloaded by modem from the PC Magazine Interactive Reader Service. There is no charge for this service, but users are cautioned that these programs are copyright material and are made available only for individual, noncommercial use. Making copies for others (including placement on other electronic bulletin boards), with or without charge, is a violation of the Ziff-Davis copyright.

The modem number for PC-IRS is (212) 696-0360. Set your modem and communications software to use 1,200 (or 300) bps, 8 data bits, 1 stop bit, no parity. PC-IRS files with a .COM, .EXE, or .ARC extension require that you also use the Xmodem error-checking protocol; our other files (e.g., with extensions of .ASM or .BAS) can be downloaded using either regular ASCII or Xmodem transmission.

FREEZE.BAS, whether typed in from the magazine at your keyboard or

downloaded from PC-IRS, will automatically create FREEZE.COM when run once in BASIC. FREEZE.ASM, also listed both here and on PC-IRS, allows you to modify the program but requires you to use a macro assembler (IBM or Microsoft) and execute the following sequence of commands:

```
MASM FREEZE;
LINK FREEZE;
EXE2BIN FREEZE FREEZE.COM
```

—Craig L. Stark

## FREEZE AT A GLANCE

### Syntax:

```
[d:] [path] FREEZE
```

**Operation:** After loading, FREEZE remains memory resident. It is activated by pressing Alt-NumLock, at which point the screen is blanked and program execution is suspended. The user then enters a password up to 64 characters in

length, terminating it with Enter. The computer will remain frozen until the same password is entered or the machine is turned off and then on. A warm reboot (Ctrl-Alt-Del) is prevented. When the matching password is entered, however, the original screen display is restored and program execution is resumed.

**Note 1:** In entering and reentering passwords, Alt- and Ctrl-key combinations are permitted. You can use the Backspace key to make corrections before hitting Enter, but the password is not visible on the display. Esc permits you to reenter the password.

**Note 2:** FREEZE is normally loaded via your AUTOEXEC.BAT file.

```
freeze3:    mov di,128          ;point DI to middle of PSP
            call get_password      ;get password
            cmp es,char_count      ;same number of characters entered?
            jne freeze3            ;not the same, loop back
            cmp al,27              ;was input ended with ESC key?
            je freeze3            ;yes, then start input loop over
            xor si,el              ;point SI to first password
            mov di,128              ;point DI to second password
            cld                   ;clear DI for string operations
            repa cmpw              ;compare the two passwords
            jne freeze3            ;not equal, then continue looping

;Exit freeze routine by clearing the status flag, enabling the video display,
;and executing an INT8 instruction.
;unfreeze:   mov freeze_status,B      ;reset status byte
            call video_enable       ;re-enable video display
unfrz:      pop es                ;restore register values
            pop de
            pop si
            pop al
            pop ds
            pop cs
            pop bx
            pop ss
            irst                 ;exit freeze routine
freeze:     endp

;VIDEO_ENABLE and VIDEO_DISABLE enable and disable the EGA, CGA, or MDA video
;signal depending upon the value of ADAPTER.
video_disable proc near
            cmp adapter,$           ;is this video adapter an EGA?
            je ega_disable          ;yes, then jump
            ;(Figure 1 continues)
```

in Figure 1, and Figure 2 is a BASIC listing that will automatically create FREEZE.COM when you run it once. To save yourself the labor of typing in the whole program, see the sidebar "Downloading FREEZE."

**INSIDE THE PROGRAM** For experienced programmers, the keyboard interrupt and how one can intercept it from within a resident utility is an oft-told tale. For newcomers, suffice it to say that the IBM PC keyboard has its own dedicated microprocessor—an Intel 8048—that demands the attention of the PC's main microprocessor by generating an interrupt 9 any time a key is pressed or released. When the interrupt is received, the PC's BIOS retrieves a 1-byte scan code that identifies the key. From there several courses of action are possible, depending upon exactly which key was activated, whether it was pressed or released, and

## ■ PROGRAMMING/UTILITIES

what the intended function of that key is. Some keys and key combinations place an entry in the keyboard buffer; others, like the NumLock or CapsLock key, toggle internal states that affect the meanings of other keys; still others initiate special routines, like the reboot sequence triggered by Ctrl-Alt-Del. Whether you look at the keyboard interrupt routines as rather complex or elegantly simple, they do their job well and are flexible enough to let other programs interact with them without playing havoc with the rest of the system.

**FREEZE** installs a front end for the keyboard interrupt routine that checks the scan code sent from the keyboard before the BIOS gets a chance to check it.

---

### ■ FREEZE installs a front end for the keyboard interrupt routine that checks the scan code before the BIOS gets to check it.

**FREEZE** looks for two things: First, if the freeze routine is *not* currently active (as indicated by the **FREEZE\_STATUS** flag), the program looks for the press of Alt-NumLock signifying that the user wants to initiate a lockdown. Second, if the freeze routine is already active, Alt-NumLock is ignored by simply passing control on to the normal interrupt handler (which does nothing with that key combination) but a check is made for a press of Ctrl-Alt-Del. If found, it is blocked out by resetting the keyboard and exiting the interrupt handler without ever passing control to the BIOS routine, so the BIOS never knows it was pressed. If neither Alt-NumLock nor Ctrl-Alt-Del has been pressed, control is passed on to the BIOS so that other key closures may register normally.

**RESETTING THE KEYBOARD** To reset the keyboard we must do two things. First, bit 7 of the 8255 register (mapped

```

        mov ds,mar_address
        mov al,25h
        out dx,al
        ret
    ega_disable: xor al,al
        call set_ega
        ret
    video_disable andp

; video_enable
    proc near
        cmp adaptar,B
        jne egavable
        mov ds,mar_address
        mov ah,15
        int 10h
        les bx,mar_value
        xlat
        mov al,mar_value
        out dx,al
        ret
    egavable: mov al,20h
        call set_ega
        ret
    video_enable andp

; video_disable
    proc near
        cmp adaptar,B
        jne egavable
        mov ds,mar_address
        mov ah,15
        int 10h
        les bx,mar_value
        xlat
        mov al,mar_value
        out dx,al
        ret
    egavable: mov al,20h
        call set_ega
        ret
    video_enable andp

;VIDEO_EGA is called by VIDEO_ENABLE and VIDEO_DISABLE routines to selectively
;reset or clear bit 5 of the EGA Attributes Address Register.
;Entry: AL - value to OUT to Attribute Address Register
;Exit: None

set_ega proc near
    push ax
    mov ds,3Dah
    in al,dx
    mov ds,3Dah
    in al,dx
    mov ds,3C9h
    pop ax
    out dx,al
    ret
    andp
; set_ega

;KB_RESET subroutine resets the keyboard and issues an EOI to the #259 PIC.
;Entry: None

kb_reset proc near
    in al,kb_ctrl
    mov al,al
    or al,80h
    out kb_ctrl,al
    mov al,ah
    out kb_ctrl,al
    cli
    mov al,eoi
    out iot_ctrl_port,al
    ati
    ret
    andp
; kb_reset

;GET_PASSWORD subroutine reads up to 64 characters entered from the keyboard
;and stores them in the designated buffer. Backspace key is active as an
;editing key.
;Entry: EDI - buffer address
;Exit: CX - character count
;get_password

get_password proc near
    clc
    xor cx,cx
    mov al,8
    int 16h
    cmp al,113
    je done
    cmp al,27
    je done
    cmp al,8
    cmp al,8
    jne backspace
    cmp al,64
    ja buffer_full
    inc cx
    atosw
    jmp getpaal
    or ca,ca
    add di,2
    dec ca
    dec ca
    jmp getpaal
    mov ah,14
    int 16h
    jmp getpaal
done: ret
get_password andp
;
```

;no, then load MBR address  
;disables value for CGA/MDA  
;disable video display  
;zero AL [clear bit 5]  
;disables EGA  
  
;enable the video display  
;is video adapter an EGA?  
;read MBR or CPU port address in BX  
;INT 10h function - get video mode  
;get current video mode  
;point BX to MBR\_VALUES table  
;get enable value for current mode  
;enable video display  
  
;set bit 5 of AL  
;enable EGA video  
  
;VIDEO\_EGA is called by VIDEO\_ENABLE and VIDEO\_DISABLE routines to selectively  
;reset or clear bit 5 of the EGA Attributes Address Register.  
;Entry: AL - value to OUT to Attribute Address Register  
;Exit: None  
  
;set\_ega  
;push ax  
;mov ds,3Dah  
;in al,dx  
;mov ds,3Dah  
;in al,dx  
;mov ds,3C9h  
;pop ax  
;out dx,al  
;ret  
;andp  
  
;KB\_RESET subroutine resets the keyboard and issues an EOI to the #259 PIC.  
;Entry: None  
  
kb\_reset  
;proc near  
;in al,kb\_ctrl  
;mov al,al  
;or al,80h  
;out kb\_ctrl,al  
;mov al,ah  
;out kb\_ctrl,al  
;cli  
;mov al,eoi  
;out iot\_ctrl\_port,al  
;ati  
;ret  
;andp  
  
;get\_password subroutine reads up to 64 characters entered from the keyboard  
;and stores them in the designated buffer. Backspace key is active as an  
;editing key.  
;Entry: EDI - buffer address  
;Exit: CX - character count  
  
get\_password  
;proc near  
;clc  
;xor cx,cx  
;mov al,8  
;int 16h  
;cmp al,113  
;je done  
;cmp al,27  
;je done  
;cmp al,8  
;cmp al,8  
;jne backspace  
;cmp al,64  
;ja buffer\_full  
;inc cx  
;atosw  
;jmp getpaal  
;or ca,ca  
;add di,2  
;dec ca  
;dec ca  
;jmp getpaal  
;mov ah,14  
;int 16h  
;jmp getpaal  
done:  
get\_password  
;andp

(Figure 1 continues)

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## ■ PROGRAMMING/UTILITIES

```

;INITIALIZE routine checks to see if FREEEEE has already been loaded. If it
;has, execution aborts with an error message. If it hasn't, then the value of
;ADAPTER is set according to the type of display adapter present in the system
;and the vectors in low memory pointing to the INT 9h and 1bh routines are set
;to point to our own newly installed code.
;
;initialize proc near
;
;See if FREEEEE has been previously loaded by calling INT 16h with AH set to
;255 and BH set to 8. If BH comes back unchanged, then FREEEEE is NOT
;currently resident in memory; if BH = 255, then FREEEEE has been loaded.
;
        mov ah,255          ;set AH and BH
        xor bh,bh
        int 16h             ;call interrupt routine
        or al,al
        jc init1            ;yes, then continue
        jne dx,armmsg       ;no, print error message and exit
        mov ah,9
        int 21h
        ret

;Check for the presence of an Enhanced Graphics Adapter by looking for an 'IBN'
;signature in the EGA BIOS area.
;
init1:   mov es,0FFFFh      ;set ES to EGA BIOS segment
        mov ss,es
        mov di,1Eh           ;register address of signature
        les si,ibm_signature
        cmp es:[di],si        ;check for 'IBN' test
        mov cx,3
        cld
        repe cmpsb          ;compare the three bytes
        je init2            ;signature found - EGA present
;
;The display adapter is not an EGA, so it must be either a CGA or an MDA. Get
;the address of the 6845 Under Register from the BIOS date area, calculate the
;port address of the Mode Select Register, and save it for later.
;
        mov adapterl         ;set ADAPTER for CGA or MDA
        mov es,bios_date     ;set ES to BIOS date area
        mov ss,es
        assume es:bios_date
        mov adapter,6845      ;get 6845 address
        add es,4              ;add 4 to get MSR address
        mov msr_address,ax    ;leave address
;
;Save the current interrupt 16h vector and replace it with our own.
;
init2:   mov ah,35h          ;DOS function - get vector
        mov al,16h            ;interrupt 16h
        int 21h               ;get the vector
        mov int_16h_ptr,hx    ;save offset portion of vector
        mov int_16h_ptr[2],es   ;save segment portion of vector
        mov ah,25h             ;DOS function - set vector
        mov al,1bh
        int 21h               ;interrupt 16h
        les dx,new_int_16h     ;pointer to new routine
        int 21h               ;set vector
;
;Now save the old interrupt 9 vector, replace it with the new one, and exit.
;
        mov ah,35h          ;DOS function - get vector
        mov al,9h              ;interrupt 9
        int 21h               ;get vector
        mov int_9h_ptr,hx      ;save offset
        mov int_9h_ptr[2],es   ;save segment
        mov ah,25h             ;DOS function - set vector
        mov al,9h
        int 21h               ;interrupt 9
        les dx,d_freeze       ;pointer to our freeze routine
        int 21h               ;set vector
        les dx,initialise     ;prepare DX for exit
        int 27h               ;terminate-but-stay-resident
initialise endp
;
code ends
end begin

```

(Figure 2 ends)

into memory at port address 61h) must be set, then cleared. Bit 7 disables the keyboard when it is set and enables it when zeroed. (The 8255, also known as the Programmable Peripheral Interface, is used by several of the computer's peripheral devices—like the keyboard—to communicate with the CPU through the system bus.) The second thing we must do is to tell

the 8259 Programmable Interrupt Controller (PIC), through which the keyboard interrupt was funneled on its way to the microprocessor, that this interrupt is terminated. If we neglect to do that, all interrupts of the same or lower assigned priority will be masked out and unable to initiate execution of special interrupt-handling code. Needless to say, the system simply

cannot be allowed to operate like that.

Once we've accomplished the reset, though, and exited through an IRET instruction, the keypress just signaled by the 8048 passes into oblivion, so to speak: the PC's BIOS never knows about it. In reality, the whole process is easier to pull off than it may sound and is illustrated in the **KB\_RESET** routine in the FREEZE source code listing.

**BLANKING THE DISPLAY** Once a freeze is requested, video is immediately disabled so that the contents of the screen are hidden from unauthorized persons. Blanking the display in these days of multiple video adapters is no trivial task, since

- Blanking the display is no trivial task, since almost every adapter has its own way of manipulating the video output signal.

almost every adapter out there has its own way of manipulating the video output signal. FREEZE will work with nearly any variety of Color/Graphics Adapter (CGA), Monochrome Display Adapter (MDA), or Enhanced Graphics Adapter (EGA), but the program must go through some interesting gymnastics during its initialization phase to determine just what kind of adapter is being used.

First, FREEZE uses the method of detecting the presence of an EGA that has almost become a standard: it checks for the three letters "IBM" at absolute address C000:001Eh. Since the capabilities of the EGA far surpass those of any earlier adapters, the EGA comes complete with its own BIOS routine, which supplements the normal system BIOS (and replaces the functions of the video interrupt, INT 10h). The EGA BIOS is located in segment C000h. Most or all of the EGA boards on the market, including third-party boards, contain

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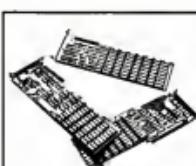
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#### ■ PROGRAMMING/UTILITIES

the "IBM" signature for compatibility reasons. If FREEZE finds the signature at the appropriate address, it knows that it must adapt any hardware-dependent video routines for the EGA.

If the "IBM" hallmark isn't there, the program assumes that either a CGA or an MDA is in use. In that case, the FREEZE initialization routine accesses the BIOS data area that begins at 0040:0000h, obtains from that the address of the 6845 Index Register, and then calculates the address of the register that contains the bit that enables or disables the video signal. For a CGA, that register is called the Mode Select Register; for an MDA, it's called CRT Control Port 1. In either case, setting

## ■ GET PASSWORD

allows the typist to enter up to 64 characters and use the Backspace key for editing.

or clearing bit 3 of the register enables or disables video, respectively. The base address of the 6845 is different for a CGA and an MDA, but in both cases the address of the register that controls video output is obtained by adding 4 to the 6845 address. Thus armed, FREEZE is prepared to blank and unblank almost any type of display you might wish to attach.

Manipulating video on an Enhanced Graphics Adapter is slightly more involved. Bit 5 of the Attribute Address Register, mapped into memory at 3C0h, controls the video signal. The only complication in setting or clearing this bit arises from the fact that there are actually two registers (the other being the Attribute Data Register) mapped to that port address. The destination of bytes sent to that port is determined by the state of an internal flip-flop. To ensure that we write to the Address Register, we must first reset the flip-flop by performing a read at address 3BAh for a monochrome monitor or at 3DAh if a color monitor is attached.

**HANDLING THE PASSWORD** With the screen blanked, FREEZE turns its attention to the keyboard to get a password from the user. The GET—PASSWORD

subroutine allows the typist to enter up to 64 characters and use the Backspace key for editing. You may wish to note one interesting little trick involving memory us-

**Figure 2:** A BASIC program that will automatically create FREEZE.COM

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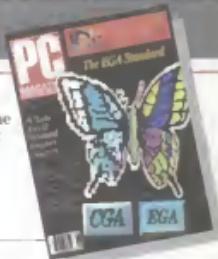
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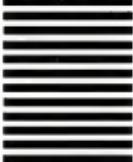
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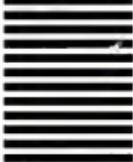
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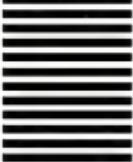
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age. A dedicated buffer space is required for each of the two keywords entered (one for the first, another for the second one used for comparison). Each password can consist of up to 64 characters, and each character is stored in memory as a 16-bit word so that odd combinations of keys (all the ones that return a 2-byte extended code) can be recorded. This means that each password can require up to 128 bytes of storage space and that 256 bytes are required for both.

The normal procedure is to use an assembler directive to set aside 256 bytes of memory in the data area of the .COM file. But the fact that FREEZE becomes memory resident gives us a cleaner, more efficient way to buffer the keyboard input. When a .COM file is first loaded for execution, DOS builds a 256-byte header called a Program Segment Prefix (PSP) at offset 0 in the code segment. The PSP contains a wealth of information needed by DOS to actually run the program. Once we make our code resident, however, and set an interrupt vector to point to it as a means of achieving entry, the PSP is no longer needed. Unless we use a couple of relatively fancy tricks to eliminate the PSP before issuing the terminate-but-stay-resident call, it stays there, wasting space.

But we can play those tricks. Rather than declaring a 256-byte area to be set aside for password buffering, we can just use the first 128 bytes of the PSP area for the first password and the second 128 bytes for the second. That's exactly what FREEZE does. When the program sets the buffer offset address in the DI register prior to calling GET\_PASSWORD, it always loads DI with the value 0 or 128 rather than with an explicit offset address. That makes maximum use of memory.

With the primary password buffered at offset 0 in the code segment, FREEZE enters a continuous loop that can be broken only by entering a password that exactly matches the first. GET\_PASSWORD is called again to facilitate keyboard entry, and when the Enter key is pressed, the string just entered is compared character by character to the first. If they match, the freeze is terminated; if they don't, the secondary buffer pointer is reset to offset 128 and GET\_PASSWORD is called again for another try. During this time, the cus-

tom keyboard interrupt handler installed on the front end of the normal BIOS routine monitors the keys for a press of Ctrl-Alt-Del. If it detects that combination, it does not let it pass through to cause a reboot; instead, it simply exits through an IRET instruction (after going through the steps to formally end the interrupt) as if the keys had never been pressed.

To end the freeze routine, the status byte FREEZE\_STATUS is cleared to signify that the PC is no longer locked, video is enabled again, and execution is

---

## ■ The fact that FREEZE becomes memory resident gives us a cleaner way to buffer the keyboard input.

---

transferred right back to the point in the application program where it left off. FREEZE once more quietly sits in the background, waiting for a press of Alt-NumLock to signal that the computer is to be secured.

### PREVENTING MULTIPLE LOADS

It's imperative for smooth operation that once FREEZE is loaded, it can't be loaded again right over the top of itself. If multiple loading occurred, a duplicate press of the trigger keys could cause nasty results by confusing passwords and implementing a double freeze. To ensure that it can't be installed more than once, the FREEZE initialization routine attaches a front-end routine to interrupt 16h.

Normally, if INT 16h is called with AH set to 255, the contents of the BX register are not changed. (You'll see this if you look at the BIOS listing in the IBM PC Technical Reference manual.) Our new INT 16h routine checks the value of AH on entry. If it's not 255, then control is passed on to the normal interrupt handler. If it is 255, however, the value of BH is set to 255, providing verification for any calling program that cares to check the value of

BH before and after the call that the new routine was indeed invoked. That's how we use it. Before FREEZE issues the call to terminate but stay resident, it sets AH to 255 and BH to zero, calls INT 16h, and sees if BH returns set to zero or 255. If it's zero, then FREEZE could not have been installed previously; had it been, BH would have returned with the value 255. Likewise, if BH is 255, then FREEZE must have already been installed. Using this method is far more reliable (although not foolproof) than the frequently used technique of setting an ASCII signature or code in the Intra-Application Communication Area in the BIOS data area. It's too easy there for the signature to be overwritten by another application, erasing the only record showing that the resident utility had already been loaded.

**COMPATIBILITY** FREEZE is compatible with most other memory-resident programs, but, I'm sure, will not work with some. If you encounter this kind of difficulty, remember that the order in which concurrent memory-resident programs are loaded will often determine whether or not they interfere with each other. It's important, for example, to load SideKick after loading other resident utilities, as its manual exhorts. FREEZE will co-reside with SideKick with some degree of compatibility if FREEZE is loaded first. I say some degree of compatibility because strange things can happen if you try to invoke SideKick while your PC is frozen. You can effectively lock out SideKick by calling it up on-screen before pressing Alt-NumLock to secure the computer.

Finally, in using FREEZE where the need for security is serious, remember both to be creative in choosing a password and to change it often. Many password security schemes are rendered useless simply because the user picks an easily guessed word or phrase like his last name or the street he lives on for his password. Remember that the success of any security plan depends almost as much on you as it does the system itself, and that by being clever and cautious you can almost certainly ensure the privacy of your data.

*Jeff Prosise is a frequent contributor to PC Magazine.*



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CIRCLE 148 ON READER SERVICE CARD

■ JARED TAYLOR

# SPREADSHEET CLINIC

*Ways to roam through a spreadsheet and return; speeding up loading and macro execution in 1-2-3, Release 2.0; and a password-controlled breakout procedure.*

## SLOW LOAD IN RELEASE 2.0

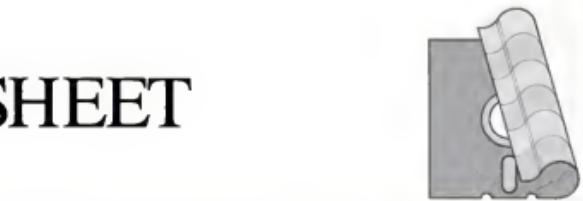
In Volume 5 Number 15's Spreadsheet Clinic you published a submission in which I explained how to speed up the file retrieve operation in 1-2-3, Release 2.0. I have since devoted more study to this problem and have written a better macro for cutting the load time.

In my original submission, I suggested putting a dummy file and an AUTO123 file containing an autoexecuting (\0) macro on each data disk. Instead, you should put the AUTO123 file on your 1-2-3 system disk (or hard disk) and include in it the autoexec macro shown in Figure 1. This eliminates the need for any dummy file and also means you need only one AUTO123 file.

For the Figure 1 macro to work, the default 1-2-3 directory must be the system disk. Since the second line of the macro changes the default directory but does not update the configuration file, 1-2-3 will look for AUTO123 on the system disk every time it starts.

I've found that a command to combine a named range (/fcenRANGE . . . etc.) will make 1-2-3 revert to slow loads. This is easy to forget, so if I combine a range in a macro I try to remember to follow it with /fce[esc 6].

The time it takes 1-2-3 to load the same files, before and after running the speed-up sequence, is shown in the chart in Figure 2. The difference is not great when files are under 64K, but with larger files the amount of time 1-2-3 takes in the slow mode is nothing short of ridiculous. Do you know whether or not Lotus intends to address



```
\0          /fce[esc 6]    to set 123 for faster loading
wdd[esc]B:Q  change data drive to drive B
/\r{quit}   :stops with the 123 file listing
```

Figure 1: A macro that speeds up the retrieve operation in 1-2-3, Release 2.0.

SIZE BYTES	TIME - SEC FAST(FCCB)	TIME - SEC SLOW (FCCN)
4242	6	6
12451	11	11
16246	14	14
31435	24	25
58995	27	31
71375	36	62
98240	44	130
96583	47	132
118888	58	178
127155	68	195
133411	62	214
151137	78	290
159771	74	313
283728	138	863

Figure 2: A comparison between Release 2.0's fast and slow retrieval speeds.

this annoying problem soon?

J. E. Kirkpatrick  
Canyon Lake, Texas

*Quite a few readers have written to say how much they have benefited from Mr. Kirkpatrick's first submission, and some have proposed improvements similar to this one. Yes, Lotus has promised to increase the speed of file retrieval in future.*

## SCREEN TURNOFF

I'd like to call the attention of your readers to a way of speeding up macro execution in 1-2-3, Release 2.0. The trick is to use

{windowsoff} and {paneloff}. The 1-2-3 manual points out that you can gain speed this way and, depending on the kind of operation the macro does, the gain can be dramatic.

For example, I have a macro that scans a spreadsheet looking for a particular string and counts the number of its occurrences. The following table summarizes the speed effect of turning off screen updates.

Keyword	Running Time
None	45 seconds
{windowsoff}	35 seconds
{paneloff}	35 seconds
{windowsoff} & {paneloff}	22 seconds

You can see that by using both keywords you can cut execution time in half.

A. Larry Aaron  
Oak Ridge, Tennessee

*If you don't use these keywords, Release 2.0 executes macros slightly slower than Release 1A did.*

*Some people find it unnerving that, when you turn both panel and windows off, nothing appears to be happening while a macro executes. You get a CMD message, but the screen doesn't even blink until the macro is finished. If you are writing long routines for other people, you might in-*

## ■ SPREADSHEET CLINIC

*clude an initial step that displays a message like "Please wait while totals are calculated . . ." before completely turning off the screen. This way people won't think they somehow messed up your macro and start hitting Esc or Ctrl-Break.*

### BREAKING OUT OF BREAKOFF

Release 2.0 of 1-2-3 has a {breakoff} macro keyword that prevents users from exiting a routine by hitting Ctrl-Break. This can be very useful, but there are times when the macro designer really needs a "back door" out of the routine in spite of {breakoff}.

The menu in Figure 3 includes a hidden option with a password that lets authorized users issue a {breakoff}. Invoke the menu by running the macro \M, which issues {breakoff}. (The final {branch \M} means that you can't back out of the menu by hitting Esc.)

The first two menu choices, in columns C and D, can be anything, but here they increment or decrement COUNT by ten. The third choice, in column E, is invisible because cells E3 and E4 contain only apostrophes. Thus, when you move the cursor to the third choice, the cursor disappears. However, if you then hit Enter, cell E5 will run a {getlabel} and store what you enter from the keyboard in the cell named PASSTEST. The {getlabel} routine is also invisible, because there is no prompt string. Cell E6 then compares what you entered at the keyboard with the password, which in this case is BINGO. Case matters. If what you entered passes the @ex-

act test, cell E6 will go on to issue a {breakon} and return you to the menu. You can now stop the macro with Ctrl-Break.

If you wanted an even more secure break procedure, you could hide the macro cells in column E, as well as PASSTEST and its range name.

Jeffrey Kahn  
Setauket, New York

*This is one of the sharpest routines I've seen in some time.*

### MACROS FOR WANDERERS

In Spreadsheet Clinic of June 10, 1986 (Volume 5 Number 11), a reader submitted two macros as follows:

```
\H  /rnHERE {BS}-
\R  {goto}HERE
```

Their purpose is to make it easier to leave a cell temporarily and then return. The first macro notes the starting cell location by giving it the range name HERE. When you want to get back to HERE, you run the second macro.

There's a problem with this. When you choose your starting cell and run the first macro, any cell in the worksheet that contains a formula referring to that starting cell now refers to HERE. This is fine the first time you run the macro. If you run it repeatedly, however, the formulas that referred to the original starting cell will be constantly updated so as to refer to the current address of HERE. This reference to unintended cells can wreak havoc on the spreadsheet's original formulas.

To avoid this problem, change the second, or "return", macro, as follows:

```
\R  {goto}HERE /mdHERE
```

This will get rid of HERE after each use and will preserve the original formulas in cells that refer to the starting cell. Just be sure to use the "return" macro after each use of the "here" macro.

Thomas Kontos  
Memphis, Tennessee

*Mr. Kontos's point is well taken. The original macros could do serious damage to a spreadsheet without your even knowing why. For Symphony and Release 2.0 users, the next letter presents a single macro that does almost the same job without using a range name.*

### ADVANCED WANDERING

Figure 4 shows a macro that lets you go anywhere within your Symphony or 1-2-3, Release 2.0, spreadsheet and then return to where you were. Hit Alt-G, type in an address or range name, and hit Enter, to set the cursor. You can then move around the spreadsheet all you want, but the next time you hit Enter, the cursor will return to its starting place. The display in the second line of the macro is actually the formula at the bottom of the figure.

The range name, \G, refers to both lines of the macro, not just to the starting cell. Thus Alt-G will run the macro, and the {recalc \G} in the first line will also recalculate the @cellpointer function in the second line. It is @cellpointer ("address")

C	D	E
3 Add	Subtract	
4 Add ten to count.	Subtract 10 from count.	
5 {let count,count+10}	{let count,count-10}	{gatlabel "",passtest}
6 {menubranch menu}	{menubranch menu}	{if @@exact(passtest,"BINGO")}{braakon}
7		{menubranch menu}
8		
9		
10		
11	\R {BREAKOFF}{menubranch menu}{branch \n}	
12		
13	COUNT	10
14		
15	PASSTEST	BINGO
16		
17		
RANGE TABLE		
COUNT	D13	
MENU	C3	
PASSTEST	D15	
\M	D11	

Figure 3: A menu with a "back door" that lets you break out if you know the password.

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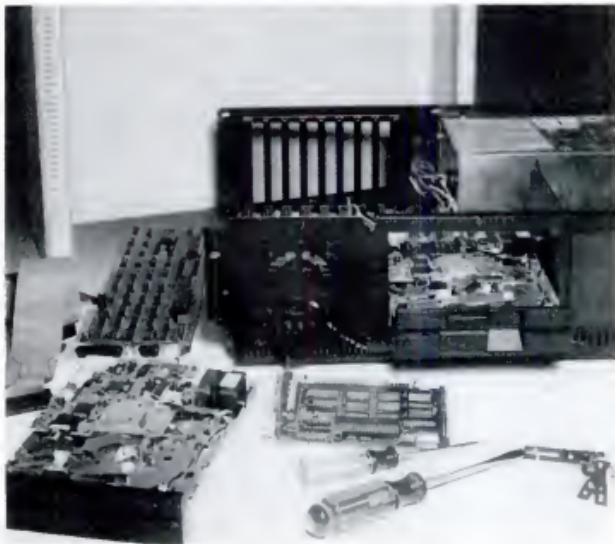
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that establishes the location of the cursor at the time you run the macro.

The first `{?}` halts the macro and waits for you to enter an address to go to. The second `{?}` halts the macro again and lets you move around the worksheet or edit a cell. After the next Enter, the cursor will return to the address established originally by the `@cellpointer` function. The second line of the macro begins with a tilde (~) in case you want to enter something into a cell before you return to the starting cell.

Besides letting you move around the spreadsheet and return to where you started, this macro is also good for verifying the location or spelling of a range name. If you enter a valid range name, the macro will take you there.

Mark McGilvray  
Los Angeles, California

*Clever as it is, this macro doesn't quite let you do everything that the earlier pair of*

```
'@ {recalc @C{goto}{?}{?}}
{goto}#B$12
```

The actual contents of the second line of the macro:  
+~{goto}"&@CELLPOINTER("address")&~"

Figure 4: A single macro that lets you roam and return.

macros does. With that pair, you can work in a distant part of the spreadsheet for as long as you like, editing and copying cells, before you return to the starting point with Alt-R. Mr. McGilvray's macro is more for exploring distant parts of the spreadsheet than working in them because it allows you only one Enter before it takes you back where you were.

One interesting feature of Mr. McGilvray's macro is that it works differently depending on whether the spreadsheet is on auto recalc or manual recalc. On auto recalc, if you edit a cell while you're out exploring, you won't return to the starting location. This is be-

cause entering something in a cell updates the `@cellpointer` function. Thus the destination of the second `{goto}` becomes the cell you moved to, not the one you moved from.

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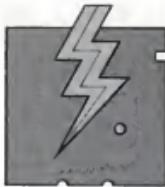
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■ EDITED BY CRAIG L. STARK

# POWER USER



*Cross-tabulating in dBASE, using format files instead of macros, solving a Prokey/Word conflict, setting colors in Crosstalk, and putting printer controls in batch files.*

## MORE-COLORFUL CROSSTALK

Arthur Mercier's discussion in Power User on setting screen colors in *Crosstalk XVI* (Volume 5 Number 14) states that in order to get all three *Crosstalk* color commands to work properly in the *Crosstalk* command (.XTK) file, the colors must be set on three lines that are not close to each other. (He suggests using lines 11, 40, and 85.) I have had no trouble setting the colors using lines 37, 38, and 39.

I set my colors in Version 3.61 as follows:

```
SC H gk
SC N wb
SC L wr
```

These settings give me green highlights on a black background, white text on a blue background, and a white-on-red status line.

The settings may work on these three lines because they come after *Crosstalk* sets its operating and communications parameters.

Mark G. Schoenberg  
Arlington, Virginia

*Using lines 37, 38, and 39 for the color settings seems to work on my copies of Versions 3.5 and 3.6, in addition to Version 3.61. What's more, it works better than spreading the commands out. With the commands on lines 37 through 39, the colors change immediately on loading the .XTK file. When using lines 11, 40, and 85, the command line colors don't change until you enter a command.*

*An alternate position for the three color*

*lines is towards the end of the .XTK file, just after the function key commands but before the LO or GO statements. Microstuf recommends this alternative. I tried both placements on Versions 3.5 and 3.6, and both seem to work equally well.*

*While on the subject of color, I should pass along Microstuf's assurance that the blinking color problem in VT-100 emulation has been fixed. (The blinking problem was covered in the same column as Mr. Mercier's tip.) According to a Microstuf spokesman, updates are available free of charge.* —M. David Stone

## PAY UP OR LOCK UP

Here is a simple but very effective way to ensure payment from a customer for the work you've done in programming a custom application. Just place a trap procedure like that shown in Figure 1 in the front end of your program and set the cutoff date as desired. If the system date is beyond your cutoff, the trap procedure deactivates the Esc key and starts an endless loop. This will effectively render the program useless.

Note that the trap is defeated if the system date has not been set. For maximum

```
IF DATE() > CTOOD('10/31/86')
  SET ESCAPE OFF
  CLEAR
  SET COLOR TO R*
  ? "30 DAYS ARE UP."
  ? "YOU HAVE NOT PAID FOR THIS PROGRAM."
  ? "CALL ME FOR INFO."
  DO WHILE .T.
  ENDDO
ENDIF
```

Figure 1: A dBASE routine guaranteed to get a delinquent customer's attention.

protection, your program should be compiled to disallow the possibility of someone removing these code lines.

After payment, just give a non-trapped version to your customer.

Robert T. Collina  
Lake Hopatcong, New Jersey

*If your backbone's not quite as stiff as Mr. Collina's, you might soften his message by substituting something about a "30-day demonstration period." And rather than send the client's computer into a complete coma, a WAIT statement followed by QUIT might be just as effective in getting payment without infuriating the valuable person looking at your screen.*

*But I like this guy's style.* —Brad Stark

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As a *WordPerfect* user, I've found that macros can take much of the drudgery out of writing business letters. I use BLET (for Business LETTER) as a straightforward text macro. It creates the skeleton of a letter, with date, greeting ("Dear . . ."), and salutation ("Yours truly," etc.). I then fill in the name, address, and the body of the letter.

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If more than one person is using your system, you can create a separate macro for each signature block.

Peter G. Aitken  
Durham, North Carolina

You can manage the same effect with virtually any word processor, whether it has macros or not. You just have to create a series of format files—i.e., text files that already contain the format settings and the boilerplate text that you want. Then you can open a new file at any time, read in the format file, and add the new text. I've used format files with WordStar for years and have developed files for memos, letters, and several manuscript formats.

Format files have an important advantage over macros because you can easily go into a file and change it. This not only lets you modify old files but also gives you a head start when you want to create new formats. You can start with a letter format, for example, copy it to a new file, then change it to a memo format without having to type everything from scratch.

One other note: Whether using macros or format files, it's helpful to give all of them similar names. I use HEADLTR, HEADMEMO, and so forth. This makes them easier to remember and also groups them together if your word processor lists files alphabetically.—M. David Stone

```
*** XTAB.PRG
SET TALK OFF
CLEAR
nvar=#
origfile=SPAC(28)
? 3,0 SAY "CROSS TAB PROGRAM"
? 5,0 SAY "which file?" GET origfile
READ
origfile=TRIM(origfile)
? 7,0 SAY "How many variables?" GET nvar
READ
SELE 1
USE origfile ALIA origfile
keyexp=#
* keyexp = list of vars delimited with plus signs
i=1
DO WHILE i<=nvar .AND. LEN(keyexp)<258
  nomvar=SPAC(25)
  ? 6+i,0 SAY "Variable "+STR(i,2)+" field/expression? " GET nomvar
  READ
  nomvar=TRIM(nomvar)
  IF TYPE({!nomvar})="N"
    * note: change below if decimals
    keyexp=keyexp+STR({!nomvar},18,0)
  ELSEIF
    keyexp=keyexp+nomvar
  ENDIF
  IF i>nvar
    (continued)
```

Figure 2: A multiway dBASE cross-tabulation program.



## ■ POWER USER

RUN BEEP /f4000 /r3 /d3  
RUN BEEP /f4000 /r3 /d1

*A musically minded user may want to announce that he's ready to start his process with*

RUN BEEP /f1000 /r3 /d1  
RUN BEEP /fB00 /d8

—Brad Stark

### PRINTER CONTROLS FROM BATCH FILES

My word processor automatically puts my IBM Proprinter into near-letter-quality mode and leaves it there when I exit to DOS. This can be counterproductive if I then wish to print out some files in draft quality mode. To reset the printer to draft mode, I've added the following line to my word processor batch file (immediately after the line calling up the word processor):

TYPE DRAFT.ASC > LPT1:

■ The outline function in Microsoft Word 3.0 has a minor conflict with ProKey 4.0. Fortunately, there is a way around this problem.

The file DRAFT.ASC contains the following line:

<ESC>I@

This escape code is the command to tell my printer to go to draft mode. The <Esc> must be created by a text editor

that lets you embed control characters in text. With WordStar or SideKick, for example, you would type Ctrl-P <Esc>. In WordStar, this will show on-screen as "[. If you type the file to the screen in DOS, the escape code will not show at all.

With this line added to my batch file, if the printer is off when I exit the program, DOS will respond with a "Write fault error" and the standard "Abort, Retry, or Ignore" option. I can then choose the abort option or turn the printer on and choose retry instead.

One simple extension of this method is to create a series of such batch files for different modes (NLQ, condensed, draft). Then you can conveniently switch between modes when printing ASCII files from DOS.

Stephen P. Walker  
Austin, Texas

*To take this hint one step further, you can*

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create batch files that will set the printer mode and start printing with a single command. For example, if NLQ.BAT reads

```
TYPE NLQ.ASC > LPT1:  
TYPE %1 > LPT1:
```

and NLQ.ASC contains the escape sequence for NLQ mode for your printer, then you can set the printer and start printing with the simple command

#### NLQ filename

To avoid surprises, you might want to choose a "standard" setting for the printer and add the appropriate command for that setting at the end of each batch file.

—M. David Stone

#### WORD WITH MACROS

The outline function in Microsoft Word 3.0 has a minor conflict with ProKey 4.0; if you load ProKey before Word, you lose the ability to collapse and expand the out-

line. Fortunately, there's a way around this problem.

The trick here is to load ProKey with PKLOAD, run PROKEY choosing the "q" option to quit, load Word, and then, from within Word, load ProKey again using the Library/Run command. Everything through loading Word can be handled automatically through a batch file. If you're using a hard disk and have Word in the Word subdirectory and ProKey in the Keys subdirectory, the batch file would look like this:

```
cd c:\word  
c:\keys\pkload  
c:\keys\prokey /q  
word
```

After Word is loaded, you just type

```
ESC  
L  
R
```

Then load ProKey as usual.

John Dickinson  
Huntington Station  
Long Island, New York

*According to a Microsoft spokesman, this problem is being worked on for future releases of Word. In the meantime, users will have to put up with manually loading ProKey from within the program.*

—M. David Stone

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■ PAUL SOMERSON



# USER-TO-USER

*Access all your subdirectories from a batch file, protect your AUTOEXEC.BAT (or abort it selectively), and beat a BASICA 3.2 size bug.*

## BASIC BATCH ENHANCEMENTS

I've devised a system that creates a batch file that can access all of the subdirectories on your disk.

The DIRSTART.BAT file in Figure 1 searches the disk and writes a list of the subdirectory names into a file called DIRS.DAT. It then runs the DIRS.BAS program in Figure 2, which processes the contents of DIRS.DAT and creates the DIRS.BAT batch file. DIRS.BAT will contain each of your subdirectory names, preceded by two replaceable parameters, and will run commands across your entire disk, such as

```
DIRS DIR /*
```

A similar program, DIRS2.BAS (shown in Figure 3), works like DIRS.BAS except that it places the replaceable parameters in different places (the second goes after the subdirectory name), which allows wildcard directory searches and operations such as

```
DIRS2 DIR *.COM
```

If you try DIRS2.BAS, be sure to change the last line in the DIRSTART.BAT batch file that runs it, from BASICA DIRS to BASICA DIRS2

For example,

```
DIRS DSORT N
```

uses one of the programs in *The Norton Utilities* to sort all subdirectories by file-name,

```
DIRS2 DIR *.DOC
```

displays all of your .DOC filenames,

DIRS2 DEL \*.BAK  
deletes all of the .BAK files in all your subdirectories, and—try this with GREAT CAUTION!!!!!!—

```
DIRS2 DEL *.*
```

erases all files but leaves your subdirectories intact.

Steven C. Gilbert  
Avon, New York

*Once you've used CHKDSK /V | FIND*

```
ECHO OFF
ECHO Processing disk...
CHKDSK/V | FIND "Directory" > DIRS.DAT
BASICA DIRS
```

**Figure 1:** DIRSTART.BAT batch file to create list of subdirectories. This version works with DIRS.BAS; to adapt it to work with DIRS2.BAS, change the last line from BASICA DIRS to read BASICA DIRS2.

```
100 REM DIRS.BAS
110 DIM A$(256):DIM B$(256)
120 OPEN "DIRS.DAT" FOR INPUT AS #1
130 OPEN "DIRS.BAT" FOR OUTPUT AS #2
140 PRINT #2,"ECHO OFF"
150 LINE INPUT#1,A$
160 B$=MID$(A$,1,48)
170 PRINT#2,"";A$;"*";B$;
175 IF EOF(1) GOTO 190 ELSE 150
180 IF EOP(1) GOTO 190 ELSE 150
190 CLOSE#SYSTEM
*
```

**Figure 2:** DIRS.BAS program to take the list of subdirectories created by DIRSTART.BAT and process them into DIRS.BAT.

```
100 REM DIRS2.BAS
110 DIM A$(256):DIM B$(256)
120 OPEN "DIRS.DAT" FOR INPUT AS #1
130 OPEN "DIRS2.BAT" FOR OUTPUT AS #2
140 PRINT #2,"ECHO OFF"
150 LINE INPUT#1,A$
160 B$=MID$(A$,11,48)
170 PRINT#2,"";A$;"*";B$;
180 IF LEN(B$)>3 THEN 200
190 PRINT#2,"*2":GOTO 210
200 PRINT#2,"\";A$;
210 IF EOF(1) GOTO 220 ELSE 150
220 CLOSE#SYSTEM
```

**Figure 3:** DIRS2.BAS program to take the list of subdirectories created by DIRSTART.BAT and process them into DIRS2.BAT. To use this, change the last line in DIRSTART.BAT from BASICA DIRS to BASICA DIRS2.

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## PRODUCTIVITY

### ■ USER-TO-USER

"Dir" > DIRS.DAT to create the list of subdirectories, rather than write a BASIC program you can use the search-and-replace mechanism of your word processor to create batch files such as the two mentioned here. This technique shows the real brute-force power of DOS, especially when it comes to replaceable parameters. Remember to have BASIC handy when you run these, or have it in a subdirectory that's included in your PATH. You can also use our SWEEP.COM program (Programming/Utilities, Volume 4 Number 23) to do many of these jobs faster and more elegantly.

### DON'T TREAD ON ME

Software vendors often include an AUTOEXEC.BAT file on their distribution disks or provide an installation program that creates one. By merely copying the distribution disk (using COPY \*.\* to your hard disk root directory or simply installing the program, you might wipe out your own carefully designed preexisting AUTOEXEC.BAT file. Although installing each software package in its own directory can reduce this risk, the method is not foolproof. To eliminate the risk entirely, I never use AUTOEXEC.BAT as the real name for the sequence of commands I want to execute on start-up.

Since the AUTOEXEC.BAT file is no different from any other file except for its name, and since any .BAT file can execute another .BAT file, my AUTOEXEC.BAT file contains one simple, easy-to-remember command: STARTUP.BAT. STARTUP.BAT contains all the commands that would normally be in AUTOEXEC.BAT.

I never have to worry about blowing away my start-up routines by overlooking an AUTOEXEC.BAT file on a distribution disk, or an installation program that creates its own. Furthermore, the name STARTUP.BAT itself is an obvious clue as to what AUTOEXEC.BAT should contain if you ever need to re-create it.

Bruce G. Keahey  
Lakewood, Colorado

*True enough. It's insidious that some rude programs routinely corrupt both AUTOEXEC.BAT and CONFIG.SYS. It was once easy to spot this, since programs*

*would install themselves through long batch files that you could read and change with a word processor. But many programs now use .COM or .EXE files to do the installation.*

*As User-to-User readers know, another elegant protection solution is to change COMMAND.COM so that it will look for a batch file with a name other than AUTOEXEC.BAT. In fact, the first file COMMAND.COM tries to execute doesn't even have to end in .BAT. To try this, type*

DEBUG COMMAND.COM

*Find out how long your version of COMMAND.COM is by typing CX and hitting the Enter key twice. DEBUG will respond by printing the letters CX and then the file's length in hex. For instance, in DOS 3.1 you'd see*

CX 5AAA

*Then search for AUTOEXEC.BAT by typing in*

S 100 5AAA "AUTO"

*(substituting the actual length for other versions of COMMAND.COM that DEBUG prints after the CX). DEBUG will then print the address of the beginning of the name AUTOEXEC.BAT, which in DOS 3.1 would look like*

5506:130F

*(Ignore the four hex numbers on the left; they'll vary from system to system, and they don't matter here.)*

*AUTOEXEC.BAT is 12 characters long (11 for the filename and 1 for the period before the extension), so you have to remember to pad out the extra spaces if the new name you replace it with has fewer than 12 characters. To replace AUTOEXEC.BAT with STARTUP, under DOS 3.1 type*

E 130F "STARTUP" "

*To check your work, type*

D 130F

*and make sure you've written over all traces of AUTOEXEC.BAT. Then rename your old AUTOEXEC.BAT file to STARTUP and reboot. However, if you don't like changing COMMAND.COM,*



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## ■ USER-TO-USER

*the next best safeguard is to keep a subdirectory called 'BAKUP' that contains your AUTOEXEC.BAT, COMMAND.COM, and CONFIG.SYS files. If new programs obliterate your old main startup files, you can always type*

COPY \BAKUP\\*.\* \

### BASIC BUG

DOS 3.2 BASICA.COM does not save files efficiently. If a file's size is reduced, the space allocated is fixed at the largest previously saved size. This is not true for all other IBM (Microsoft) BASICS, including DOS 3.2 BASIC.COM.

The solution is to set up a macro (based on the filename being imbedded in the program at a fixed location) to first delete the current file before the updated version is saved. *SmartKey* is a big help here.

Kip Koehler  
Novato, California

Another solution is to add two lines to the beginning of your programs:

```
101 KILL"filename"
102 SAVE"filename"
```

(substituting the actual name of your BASIC A program for filename). Each time you run it, this code will delete the existing version and save the subsequent one.

Actually, when you chop a large program down to a smaller one, BASIC A 3.2 not only keeps the file size the same but actually seems to retain the discarded part of the program. To see this in action (assuming you're using BASIC A 3.2 only), run LONG.BAS to create a 10K file.

```
100 /*CREATE.BAS -- creates long file
110 DEF FNPUT$(A$)-REDIM A$(1,1,4+14*8)
120 OPEN "LONG.BAS" FOR OUTPUT AS #1
130 FOR A=100 TO 5000 STEP 18
140 PRINT #1, FNPUT$(A); : REM DUMMY TEXT*
150 NEXT:A=END
```

Get into DOS and note the file size. Then get into BASIC A 3.2, load

LONG.BAS, and issue the command to get rid of most of the file's contents:

DELETE 200-

Save the shorter file, and get into DOS and you'll see that the tiny file has the same size as the older, larger one. Then get into DEBUG, and start leaping on the D key and you'll see that the part of the file you deleted is still there.

### ABORTING AUTOEXEC.BAT

Sometimes you don't want to run your hard disk AUTOEXEC.BAT. A combination of resident programs loaded by your AUTOEXEC.BAT might cause your machine to hang. Or you might not want to run a product your AUTOEXEC.BAT installs (for example, you might not want to bring up the PC Network before doing backups).

In either case, one solution is to boot off a floppy disk in your A: drive. Or you can

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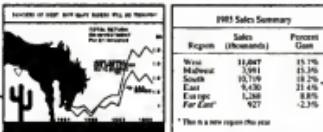
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With the help of Ram-Resident PrintMerge's useful formatting features, your document

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For instance, the chart on the left was created with Graphic Communications' Prestige for Graphics. Ram-Resident PrintMerge can merge the aligned tables made up of any combination of proportional fonts into the table on the right.



You also get full access to all the formatting you've been missing with DisplayWrite 3, Multimate, etc., which include selection of any font, right justification of any combination of proportional and monospaced fonts, and forward translation screens that give you instant access to the LaserJet's foreign language and export purpose characters. Here's a small sample of what you can type without missing a beat:

Names      1/25 Provincial      1/24 Grand  
John      Bob      Joe      Fred

Be sure to ask about Polaris Crunch, a program used with Ram-Resident PrintMerge. Polaris Crunch automatically reduces files to save the LaserJet can handle. It also resizes and crops images which allows you to print only the amount you want.

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## ■ USER-TO-USER

continuously press Ctrl-Break while your machine is booting, hoping your AUTOEXEC.BAT will abort before the critical instructions occur. Either solution is fine if you run into the problem only once in a while, but neither is ideal.

A far better solution is to use a small program called KBFLAG.COM to monitor your keyboard as you boot up and send a code to your AUTOEXEC.BAT file that an IF ERRORLEVEL instruction can trap. To create the KBFLAG.COM program, type in the following KBFLAG.SCR script, using the DOS COPY CON command or any pure-ASCII word processor:

```
N KBFLAG .COM
A
MOV AX,40
MOV DS,AX
MOV AL,[17]
MOV AH,4C
INT 21
```

```
RCX
C
W
Q
```

*Be sure to leave a blank line above RCX and hit the Enter key at the end of each line, especially the last one. Once you install this program, you can press one single key while your machine is booting to avoid running your AUTOEXEC.BAT.*

Then, add these two lines at the very beginning of your AUTOEXEC.BAT:

```
KBFLAG
IF ERRORLEVEL 1 GOTO
```

Note: The second statement is syntactically incorrect. When ERRORLEVEL is nonzero, you will get a message about a missing label (since the GOTO does not specify a label). Ignore the error message. The important thing is that the remainder of the .BAT file will not be executed.

KBFLAG simply sets the DOS ERRORLEVEL to the value of the KBFLAG in the ROM BIOS area. For details, see the Technical Reference manual for your machine. You can use different keys to trigger KBFLAG. These keys, and the codes read by IF ERRORLEVEL, are

1	= Right Shift
2	= Left Shift
4	= Ctrl key
8	= Alt-Shift
16	= ScrollLock
32	= NumLock
64	= CapsLock
128	= Ins

For example, you can avoid running AUTOEXEC.BAT if you press and hold the Shift key while your machine boots, or if you simply press NumLock while your CONFIG.SYS is running. The latter technique is preferable in some situations. (Long CONFIG.SYS files can run for over

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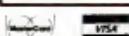
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a minute—I wouldn't want to have to hold the Shift key down that long!

You can add the above key values together. For example, if you wanted the trigger to be the Right and Left Shift keys plus the Ins key (toggled on), you would use an ERRORLEVEL trap of 131 ( $1+2+128=131$ ).

You could also make your batch file test for several ERRORLEVELs or act differently when different keys are pressed. For example, CapsLock could mean abort the AUTOEXEC.BAT, while NumLock could do everything but load a couple of resident programs. Of course, KBFLAG can be used in any .BAT file, not just your AUTOEXEC.BAT.

Nico Mak

West Hartford, Connecticut

*Stopping the execution of a batch file by forcing a syntax error works, but there's a much simpler way to avoid running the batch file. Make the first two lines of your AUTOEXEC.BAT*

**KBFLAG  
IF ERRORLEVEL 128 GOTO :END**

*and then add a line at the very end of the batch file:*

**:END**

*Then you can avoid running your AUTOEXEC.BAT file by toggling the Ins key when you boot up. KBFLAG will send a 128 to the IF ERRORLEVEL trap, which will branch to the :END label.*

*This is far more elegant than pounding on the keyboard, which can generate 301 bootup errors and force you to hit the F1 key and then restart the whole operation. Using the Ins toggle means you can branch out of the program with one simple key press, or start normally by keeping your fingers off the keyboard.*

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## SELF-MODIFYING PROGRAMS

As an amateur programmer, for years I've read warnings about using "self-modifying code" but I've never seen an example of it. What is self-modifying code, and why is it so bad?

Jeff Townsend  
Topeka, Kansas

The term "self-modifying code" refers to programs that change their own instructions. Self-modifying code is most common in assembly language to do certain things that are technically referred to as "near tricks."

As an example, Figure 1 shows a DEBUG script file for a program called HEX.COM. You can create HEX.COM by loading DEBUG and typing in the lines. You don't have to type the semicolons or comments that follow the semicolons.

HEX.COM is actually a useful program. It can add, subtract, AND, OR, or XOR (Exclusive Or) a pair of two-digit hexadecimal numbers. The command line syntax of HEX is a letter from A through G that denotes the operation, followed immediately by a colon, then the first two-digit hexadecimal number, a space, and the second two-digit hexadecimal number. It displays the result also as a two-digit hex number.

The operation letters are

- A: Add
- B: OR
- E: AND
- F: Subtract
- G: XOR

For example, to add two hex numbers (such as 43 and C8), use the line

HEX A:43 C8

The program returns 0B. (The 1 carried out of the high digit is discarded.) To logically AND these two hex numbers, use the command line

HEX E:43 C8

The program returns 40.

HEX is such a tiny assembly language program it doesn't seem to have enough code to do what it's doing. The whole bottom half of the program is devoted to routines that convert the ASCII values you

type into binary values and then from binary back to ASCII for the final display. But where's all the branching logic, depending on the first letter you type in? And where's the code to do subtraction, ORs, ANDs, and XORs?

Let's take a closer look. When you type in the HEX command line, DOS treats the initial letter as a drive indicator. It converts it to a number (where A represents drive A:) and stores it at address 5Ch. HEX.COM picks up that number, decrements it, and shifts it three bits left. It then adds it to the first machine code byte of the instruction shown in the line with the comment "MODIFIED." This changes the

N	HEX.COM	
A	MOV AL,[005C]	; Get "drive" (1,2,...)
DEC	AL	; Make it 0,1...
MOV	CL,83	; Shift left 3 bits
SBL	AL,CL	
INC	CL	; Make CL 4 for later
OR	[011D],AL	; Modify an ADD
MOV	AX,[006D]	; Get 2nd parameter
CALL	0137	; Call ASC2BIN
MOV	BL,AL	; Save in BL
MOV	AX,[005D]	; Get 1st parameter
CALL	0137	; Call ASC2BIN
ADD	AL,BL	; MODIFIED !!!!!
MOV	BL,AL	; Save result in BL
SHR	AL,CL	; Get high 4 bits
CALL	012A	; Call BIN2ASC
MOV	AL,BL	
AND	AL,0F	; Get lower 4 bits
ADD	AL,98	; BIN2ASC:
DAA		; (4 line routine)
ADC	AL,40	

(continued)

Figure 1: This DEBUG script creates HEX.COM, a program that can do a 1-byte add, subtract, OR, AND, or XOR. A little self-modifying code helps with this feat.

## ■ PC TUTOR

```

DAA          ; Write to DOS
MOV DL, AL
MOV AH, 82
INT 21
RET
CALL 8144    ; Return or Exit
XCHG AL, AH
CALL 8144    ; ASC2BIN: Call ASC2BIN2
SHL AH, CL   ; Now lower byte
ADD AL, AH   ; Call ASC2BIN2
              ; Shift higher 4 bits
              ; Stick them together
RET
ADD AL, C8   ; ASC2BIN2:
JC 814A     ; Numbers 0-9
ADD AL, 87   ; 0-9 and A-F
ADD AL, 89   ; Low 4 bits only
AND AL, 0F
RET

R CX
4F
W
Q

```

Figure 1 (cont.)

*ADD into an OR, AND, SUB, or XOR, depending on the letter you used.*

*The program is changing itself. What you see in Figure 1 is not what you get when you run it.*

*Self-modifying code is discouraged partially because it is difficult to maintain and debug. Without documentation, you might spend hours trying to figure out how HEX.COM works. (Even with the explanation I've given above, it may take some time.)*

*Obviously, I didn't write the program off the top of my head. I had to go into the Intel 8086 manual for machine code information so I could change ADD instructions into something else. HEX.COM took me much longer to write than if I had used a normal approach. The only real advantage of doing this program with self-modifying code is that it's small. Back in the days when 16K was considered a lot of memory, self-modifying code was often helpful. It just doesn't make much sense anymore.*

*The 8088 and 80286 microprocessors used in the PC and AT can also get you into trouble with self-modifying code. These two microprocessors fetch machine code instructions into the microprocessor's "instruction queue" faster than it can execute them. If you change a byte in an instruction that has already been read into the microprocessor, the change will have absolutely no effect on the code that the*

*microprocessor executes.*

*This little program will illustrate the effect of the instruction queue. Load DEBUG and type in the following:*

```

N PCORAT.COM
A
MOV AH, 2
MOV BYTE PTR [108], 50
MOV DL, 41
INT 21
INT 20

R CX
D
W
Q

```

*This creates a program called PCORAT.COM ('PC or AT'). If you run this program on a PC (or XT), it displays a P. But on an AT it displays an A. Smart hit the program, isn't it?*

*Not really. The second line of code (MOV BYTE PTR [108], 50) modifies the next line of code so it becomes MOV DL, 50 instead of MOV DL, 41. Since 41 is the hex code for A and 50 is the hex code for P, this program looks like it should always display a P. Such is the case with an 8088 microprocessor. But the 80286 is fetching machine code 2 bytes at a time and has a longer instruction queue, so the 80286 has already read in the MOV DL, 41 instruction by the time the second line of code modifies it.*

*If you load PCORAT.COM into DEBUG and trace through the first three instructions with the T (Trace) command and then enter G, it will always print a P, even on an AT. During DEBUG tracing, you're interrupting the program after each instruction, so the instruction queue is flushed. The 80286 then reads the line after it's been modified.*

*You can force the 80286 to flush its instruction queue by any instruction that interrupts sequential flow. These instructions include JMP, CALL, INT, and LOOP. The JMP doesn't even have to go somewhere else—the 80286 will flush the instruction queue even if the JMP just jumps to the next instruction. (So you see, the 80286 isn't really that smart.)*

*The ultimate in self-modifying code is a program that generates its own code and just keeps on going. Load DEBUG and type in the following lines:*

```

A
CLD
MOV SI, 108
MOV DI, 10B
MOVSW
MOVSW
JMP 10B

```

*followed by a blank line.*

*Now start entering T to trace through the program. You'll find that the last three instructions keep repeating over and over at ever higher addresses. The two MOVSW instructions copy the 4 bytes of machine code that comprise these three instructions into the higher address. The JMP flushes the instruction queue to avoid problems. Although the JMP instruction will keep jumping to a higher address, it really uses the exact same machine code. That's because it is jumping to a relative address instead of an absolute instruction.*

*You can keep tracing through this program, but after you finish up about 16,000 repeated cycles, the generated instructions will be getting close to the top of the 64K segment. They will run into the stack and you'll crash. If you're using an 8088 machine and enter a G (Go command) in DEBUG, the program will wrap around the segment and just keep on running (although it's possible that a timer-tick interrupt will interfere with it). At this point you'll have to reboot in order to get control*

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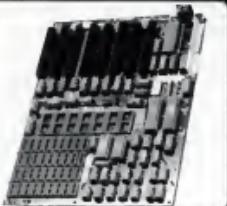
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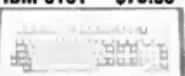
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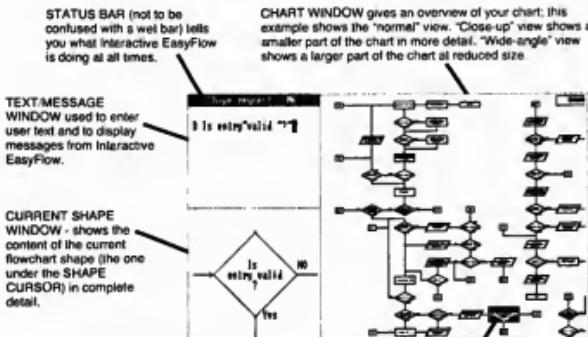
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## ■ PC TUTOR

back. If you enter a G on an 80286 machine, one of the MOVSW instructions will eventually attempt to write a word at the destination address FFFFh. That type of segment wrap is illegal in the 80286 chip and causes the chip to generate an interrupt 0Dh. IBM's PC AT will ignore that interrupt, but some AT compatibles will report the violation.

This brings me to another reason why you should be wary of self-modifying code:

Eventually we will begin abandoning the "real mode" of the 80286 microprocessor and will start writing programs for 80286 "protected mode." In protected mode, the 80286 chip itself prohibits a program from writing over its own code. This is part of what "protection" means. Programs can write only to data segments. If a program tries to write to a code segment, the 80286 generates an interrupt 0Dh. Interrupt 0Dh is the "General Protection Violation Interrupt" of the 80286 chip. Almost every instruction can cause an interrupt 0Dh under certain circumstances.

A protected-mode operating system will not ignore this interrupt, as the PC AT BIOS does. A protected-mode operating system will toss that program out of memory and make it stand in a corner wearing a dunce cap.

Actually, there is a way for the 80286 working in protected mode to allow a program to write over its own code. The operating system would have to define an "alias" data segment at the same physical area of memory as the code segment. It's not pretty, but it works.

Microsoft Windows uses a technique similar to self-modifying code in some of the routines in the Windows graphics drivers. These drivers construct programs on the stack and then execute them. If Windows continues to use this technique when it is eventually ported to a protected-mode operating system, then it will have to use aliases to define a code segment at the same physical address as the stack.

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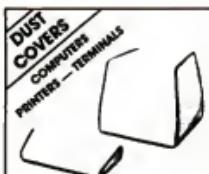
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- e  Monitors
- f  Terminals
- g  Modems

- h  Hard Disk/Tape Back-up
- i  Add-in Boards
- j  LANs
- k  Micro-Mainframe Links

### Software

- l  Communications
- m  Accounting
- n  Spreadsheets/ Financial Planners
- o  Project Managers
- p  Word Processors
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- r  Graphics

### 2) Your primary job function is (check)

- s  Administrative/ General Management
- t  MIS/DP Communications Systems, Programming
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## HOW TO STAY ON TOP OF WHAT'S WHAT IN THE PC MARKET

Are you frequently called upon to give advice about PC products? Is it your responsibility to make PC hardware, software and peripherals selections?

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ber that corresponds to the ad or article that interested you. We'll forward your name to the manufacturers or distributors so they can send you the literature you need.

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# Sudden AT™ Death. What Would You Do?

## COMING UP

**THE BEST OF 1986** As 1987 fast approaches, *PC Magazine* contemplates the noteworthy (and notorious) products of 1986. This year saw the introduction of some significant firsts: practical laptop computers, 80386-based computers, and wunderkind AT compatibles that performed at lightning-fast speeds.

The software market witnessed no revolutionary upheavals, but that doesn't mean software developers haven't been busy. We'll take a backward glance at some high-quality new releases and excellent upgrades.

**COMPUTER HYBRID** Once again IBM emerges as the leader of the technological herd with its introduction of the first computer mule. The IBM PC-XT Model 286 is the result of the marriage of an AT chip to an XT box. Where does this crossbreed fit in to the IBM PC line? Winn L. Rosch reviews the PC-XT Model 286 and comments on its role in PC society.

**MORE CHEAPEST ATs EVER** In this issue, *PC Magazine* continues to scour the compatible market in search of a low-cost alternative to the IBM PC AT that can match the excitement and the performance of the original.

**EXPANSIVE SPREADSHEETS** The standard two-dimensional spreadsheet has been a trusty companion, but does it really suit the complex way you do business? If you find the conventional spreadsheets limited, investigate the multidimensional variety. *PC Magazine* compares five of these spreadsheets and shows you how to approach three-dimensionality with 1-2-3.

**CONNECTIVITY** The Token-Ring Network is not new on the LAN circuit, but it's been only recently that IBM has decided to hook up with it. Now that it has, will its Token-Ring Network become the network against which all others are measured?



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- Clock calendar function fades and disappears
- Configuration files vanish

#### Steps to Take in Case of Sudden AT Death

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- Do not move injured computer
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- No need to call manufacturer

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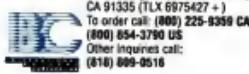
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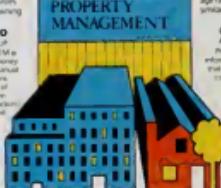
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